The RUBBER AGE

November, 1946

TECHNOLOGY DEPT.

DEC 11 1946
DETROIT

BLACK-OUT

—A new protective coating material
—Applied by brushing, spraying or dipping—

•

Resistant to

SUNLIGHT · OZONE
ACIDS · ALKALIS · OILS

Has Good Gloss—Adheres Well

May be had in—

BLACK · WHITE · CLEAR

•

Booklet and samples available

R. T. VANDERBILT CO., INC.
230 Park Avenue, New York City

TECHNOLOGY DEPT.

DU PONT ANNOUNCES

A new technical service laboratory in Akron, Ohio

PROVIDING EVEN BETTER TECHNICAL SERVICE TO RUBBER MANUFACTURERS

The construction of a new Rubber Laboratory in Akron, Ohio, is part of Du Pont's program to bring its laboratory facilities and technical personnel in closer contact with rubber manufacturers, in order to improve and speed up service to the industry.

The new laboratory provides the Midwest rubber industry with equipment and personnel for product development, technical investigation, service compounding and testing—on either natural rubber or synthetic elastomers. A complete latex laboratory has been installed for handling all phases of work on rubber or synthetic latices. So that full advantage may be taken of research developments, the Akron technical staff will work in close cooperation with the Rubber Laboratory at the Chambers Works at Deepwater, N. J.

As an added convenience to the trade, emergency stocks of rubber chemicals will be carried in the new building, which also includes modern offices for the Akron Branch sales personnel.

With the completion of the new laboratory, warehouse and sales offices at 40 E. Buchtel Avenue at High Street, Akron, Ohio, the Rubber Chemicals Division of Du Pont now offers improved service to rubber manufacturers in that area. The trade is cordially invited to inspect the new service center at any time, and to make full use of its laboratory facilities and technical personnel in working out development or manufacturing problems.

DU PONT

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

DU PONT

Rubber Chemicals

E. I. du Pont de Nemours & Co. (Inc.)
Wilmington 98, Del.

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TECHNOLOGY DEPT

SUPERIOR ABRASION RESISTANCE

Parts made from HYCAR synthetic rubber have 50% greater abrasion resistance than parts made from natural rubber. That means they'll last longer, give more dependable performance in the most severe service, and save maintenance and replacement time.

But that's only one of HYCAR's unusual and valuable properties. Examine the list in the box at the right. Think of these properties in terms of your requirements of rubber parts. Realize that these properties may be had in an almost limitless number of combinations, each designed to meet the specific service conditions of the finished part.

We have developed more than 5000 recipes for HYCAR compounds — each compound engineered to do a certain job. If you're looking for rubber parts that will give long life, dependability, and economical operation, *specify HYCAR.*

Ask your supplier for parts made from HYCAR. Test them in your own applications, difficult or routine. You'll learn for yourself that it's wise to use HYCAR for long-time, dependable performance. For more information, please write Department HD-11, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. *EXTREME OIL RESISTANCE — insuring dimensional stability of parts.*
2. *HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. hot oil.*
3. *ABRASION RESISTANCE—50% greater than natural rubber.*
4. *MINIMUM COLD FLOW—even at elevated temperatures.*
5. *LOW TEMPERATURE FLEXIBILITY—down to —65° F.*
6. *LIGHT WEIGHT—15% to 25% lighter than many other synthetic rubbers.*
7. *AGE RESISTANCE—exceptionally resistant to checking or cracking from oxidation.*
8. *HARDNESS RANGE—compounds can be varied from extremely soft to bone hard.*
9. *NON-ADHERENT TO METAL—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)*

Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATELY PRODUCED BUTADIENE TYPE

American Rubber

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

This advertisement appeared in a long list of carefully selected business papers TO HELP YOU SELL parts made from HYCAR.

"TRIPLE THREAT"

AND HOW!... Philblack A gives your products . . .

- **GOOD ABRASION RESISTANCE!**
- **HIGH HOT TENSILE!**
- **LOW HEAT BUILD UP!**

Triple qualities that pay off in greater sales appeal and better finished product performance.
If you want more information, just write—

PHILLIPS PETROLEUM COMPANY

Philblack *Division*

EVANS SAVINGS AND LOAN BUILDING · AKRON 8, OHIO

THIS year's Christmas tree lights made by Noma will feature wire insulation made from GEON. They will be safer because the insulation is self-extinguishing in case of fire. The strings will be lighter weight, easier to handle because the insulation is thinner, smoother, more flexible, than old-fashioned insulation. They will last longer because the insulation resists wear, aging, heat, and flexing—won't ever get gummy, crack, or peel from the wire.

MODERN CHRISTMAS LIGHTS

Another interesting application for GEON raw materials

These properties, plus resistance to oils and greases, foods and chemicals, water, acids, mildew, sunlight, and most other normally destructive factors, have made versatile GEON the ideal material for literally hundreds of products in the home and in industry.

GEON can be pressure or injection molded, extruded, calendered or cast into sheet or film, applied as a coating to textiles, fibres, and papers. Products made from GEON may be brilliantly or delicately colored, flexible or rigid, clear or opaque. While we make no finished products from GEON, we'll be glad to work with you on special applications. Just write Dept.K-11, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

Geon
Polyvinyl Materials

Wire manufactured by The Ansonia Electrical Division of Noma Electric Corp.

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

For technical data please write Dept. RB-11

B. F. Goodrich Chemical Company

A DIVISION OF
THE B. F. GOODRICH COMPANY

ROSE BUILDING, CLEVELAND 15, OHIO

U. S. 140 . . sounds like an express highway — doesn't it? Well, this tested GRS WHOLE TIRE RECLAIM is an express highway to speedy, safe rubber compounding.

1. **Free blending with GRS or natural rubber.**
2. **Smoothness and flatness.**
3. **Fast tubing.**
4. **Easy processing.**

A generous sample — with full particulars — gladly sent on request.

U. S. RUBBER RECLAIMING CO., INC.

500 FIFTH AVENUE • NEW YORK 18, N. Y. (Plant at Buffalo, N. Y.)

TRENTON...H. M. ROYAL, Inc., 689 Pennington Ave.

TORONTO...H. VAN DER LINDE, Ltd., 156 Yonge St.

64 Years Serving the Industry Solely as Reclaimers

Climco Liners SAVE TIME AND LABOR AT THE CUTTING TABLES

Climco Processed Liners at your cutting tables eliminate work stoppages caused by stock adhesion and improper separation. This special process has been developed to stop adhesion and permit easy separation of stock and liner.

Many other advantages are to be had through the use of Climco Liners: horizontal storage of stocks is facilitated . . . lint and ravelings are eliminated . . . freshness and tackiness are preserved . . . gauges can be more closely maintained . . . latitude in compounding is enlarged . . . brushing and cleaning of liners are avoided and liner life is increased several times.

Climco processing has been proven by practical usage in the rubber industry itself for 24 years. Try them in your plant now. Write for more complete information.

GET THE FULL STORY ON CLIMCO PROCESSING

Illustrated booklet tells about Climco Liners and Linerette. Tells how to get better service from liners. Write for your copy now.

LINERETTE
INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

THE CLEVELAND LINER & MFG. CO.
CLIMCO
CLEVELAND, OHIO, U.S.A.

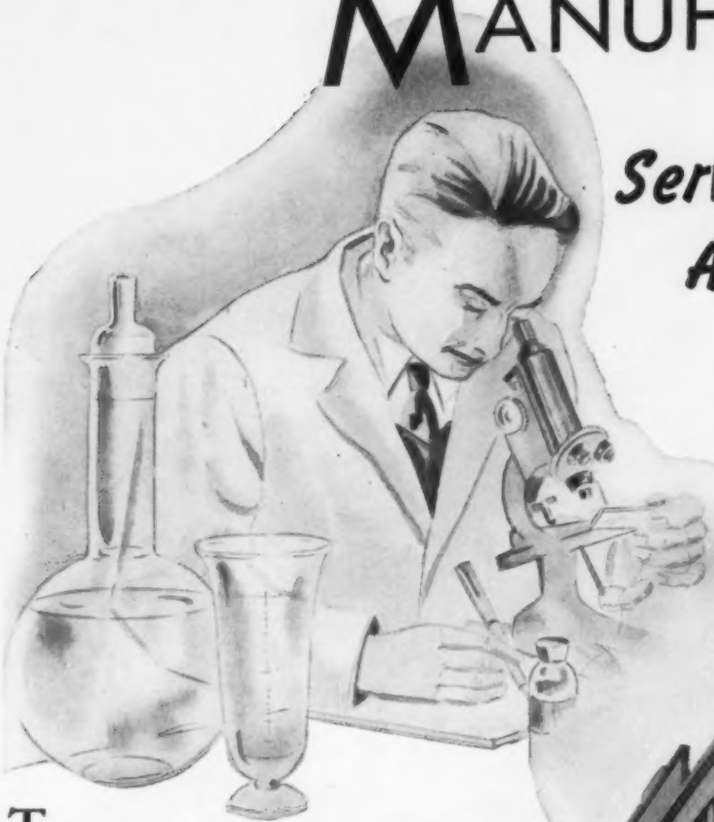
THE CLEVELAND LINER & MFG. CO.
5508 MAURICE AVENUE • CLEVELAND 4, OHIO

CLIMCO PROCESSED LINERS

for Faster, Better Production at Lower Cost

CHEMICAL MANUFACTURERS

Serving Progressive American Industries



Today Advance Solvents & Chemical Corporation, at its Jersey City, N. J. Plant, manufactures a wide variety of products designed to satisfy the exacting requirements of many of America's outstanding industries.

FOR THE PAINT AND VARNISH INDUSTRIES

Specialty Driers
Specialty Resins
Wetting Agents
Emulsifiers

FOR THE PLASTIC INDUSTRY

Cellulose Stabilizers
Vinyl Plasticizers
Vinyl Stabilizers

FOR THE RUBBER INDUSTRY

Dispersing Agents
Plasticizers
Tackifiers

FOR THE TEXTILE INDUSTRY

Adhesive Resins
Wetting Agents
Softeners

ADVANCE SOLVENTS & CHEMICAL CORP.
245 FIFTH AVENUE • NEW YORK 16, N. Y.

PELLETEX IN INDUSTRIAL RUBBER PRODUCTS

Service requirements of compounds for mechanical rubber products are most exacting. The unique properties of PELLETEX help meet these needs.

Why PELLETEX IS PREFERRED for

TRANSMISSION BELTS	Resistance to flexing and fatigue
HOSE	Tubes well and resists oil, chemicals, water and steam
GASKETS AND VALVES	Low permanent set
INTRICATE MOLDED PARTS	Easy processing

PELLETEX will prolong the resilience—and the life—of your "mechanicals." Consult our technical staff.

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GENERAL ATLAS CARBON CO.
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GUYMON, OKLA.

DISTRIBUTOR
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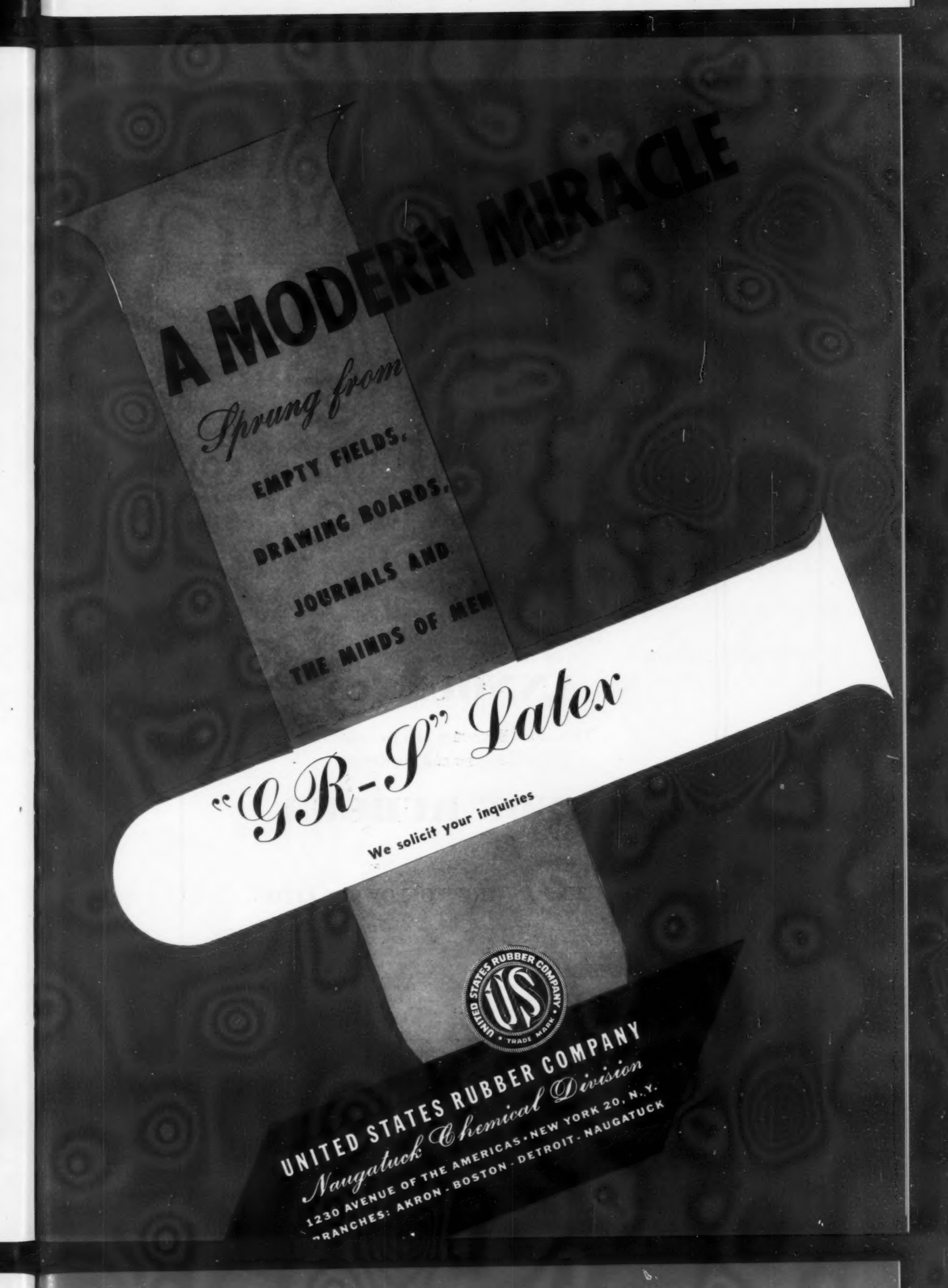

A MODERN MIRACLE
Sprung from
EMPTY FIELDS,
DRAWING BOARDS,
JOURNALS AND
THE MINDS OF MEN
"GR-S" Latex
We solicit your inquiries
UNITED STATES RUBBER COMPANY
US
TRADE MARK
UNITED STATES RUBBER COMPANY
Naugatuck Chemical Division
1230 AVENUE OF THE AMERICAS • NEW YORK 20, N.Y.
BRANCHES: AKRON - BOSTON - DETROIT - NAUGATUCK

STEIN, HALL AND COMPANY

INCORPORATED

285 MADISON AVENUE

NEW YORK 17, N. Y.

Serving American Industry for more than 80 years
as importer, manufacturer and distributor

ANNOUNCES

That, upon the return of a free market,
it will import and distribute

CRUDE RUBBER

BRANCHES IN THE FOLLOWING CITIES

Boston 10, Mass. ..... 80 Federal Street
Buffalo 2, N. Y. ..... 443 Delaware Avenue
Charlotte 2, N. C. ..... 1011 Johnston Bldg.
Chicago 4, Ill. ..... 23 E. Jackson Blvd.
Cincinnati 2, Ohio ..... 2906 Carew Tower
Detroit 2, Mich. ..... 501 Stephenson Bldg.
Los Angeles 21, Calif. ..... 1315 E. Seventh St.
Toronto, Ontario, Canada ..... 250 Van Horn Street
New Orleans 12, La., 731 Whitney Nat'l Bank Bldg.
Philadelphia 3, Pa. ..... 1600 Arch Street
Portland 4, Ore. ..... 717 Lewis Building
Providence 1, R. I. ..... 200 Grosvenor Bldg.
Rochester 4, N. Y. ..... 70 Exchange Place
St. Louis 10, Mo. ..... 4030 Chouteau Avenue
San Francisco 4, Calif. ..... 405 Montgomery Street

Product Quality... Research...Service...

FOR YOUR RUBBER CHEMICAL NEEDS

AERO* BRAND
Acrylonitrile...
DOTG and DPG...
Dibutyl Phthalate...
Rubber Sulphur...
Stearate of Zinc...
Casein

Cyanamid research, controlled production, technical service, and prompt delivery insure an immediate supply of quality materials for quality products.

ACCELERATOR #49**

AERO AC 50**

AERO AC 165**
Self-activating accelerator for GR-S

K & M
Magnesium Oxide
Magnesium Carbonate

AEROSOL* Wetting Agents

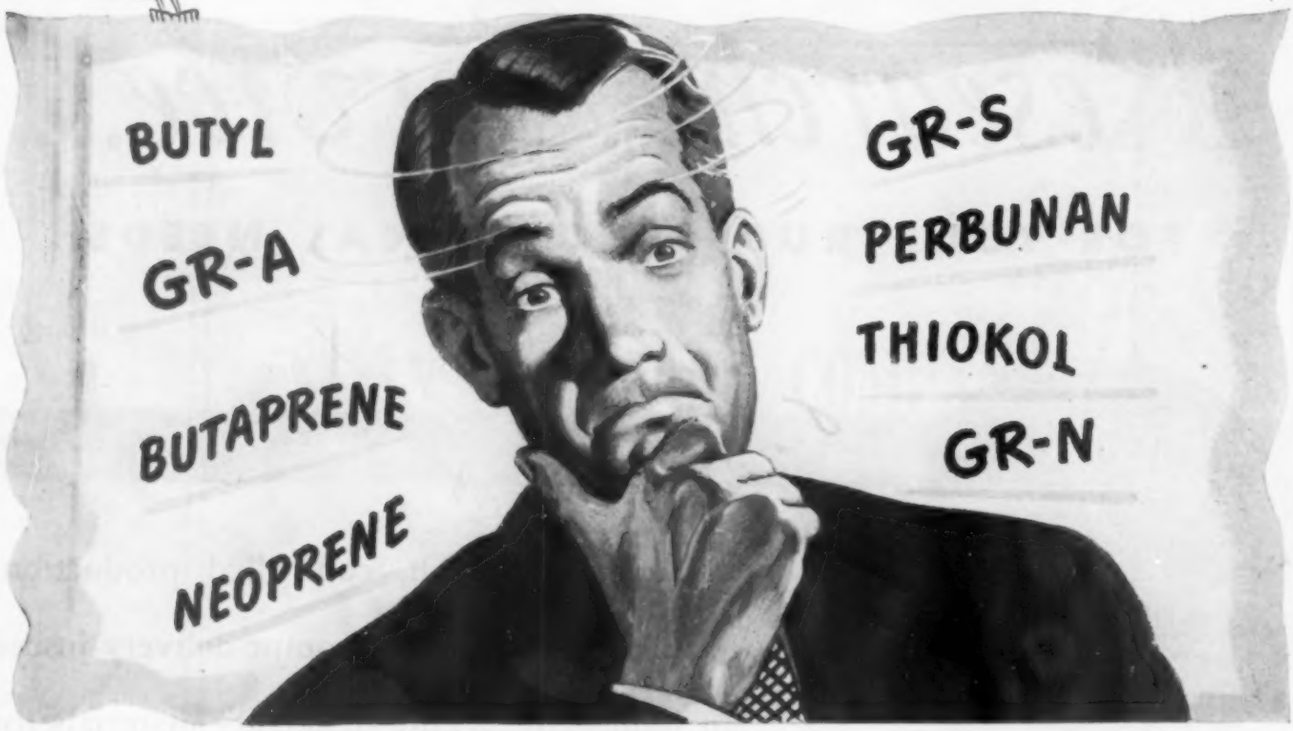
AMERICAN CYANAMID COMPANY
Rubber Chemicals Department
30 ROCKEFELLER PLAZA · NEW YORK 20, N. Y.

WHEN PERFORMANCE COUNTS ...CALL ON CYANAMID

SALES REPRESENTATIVES TO THE RUBBER INDUSTRY AND STOCK POINTS: Akron Chemical Company, Akron, Ohio • Ernest Jacoby & Company, Boston, Mass. • Herron & Meyer, Chicago, Ill. • H. M. Royal, Inc., Los Angeles, Calif. • H. M. Royal, Inc., Trenton, N. J. • In Canada: St. Lawrence Chemical Company, Ltd., Montreal & Toronto.

*Reg. U. S. Pat. Off. **Trade-mark

LIFE USED TO BE SIMPLE . . .
BUT NOT ANYMORE!



SYNTHETIC RUBBER helped win the war—but, oh brother! it brought a lot of headaches, too.

For synthetics changed a simple sorting process into a complex problem. Only painstaking checking and rechecking, much like they do in laboratories, can hope to do the job successfully from this point on.

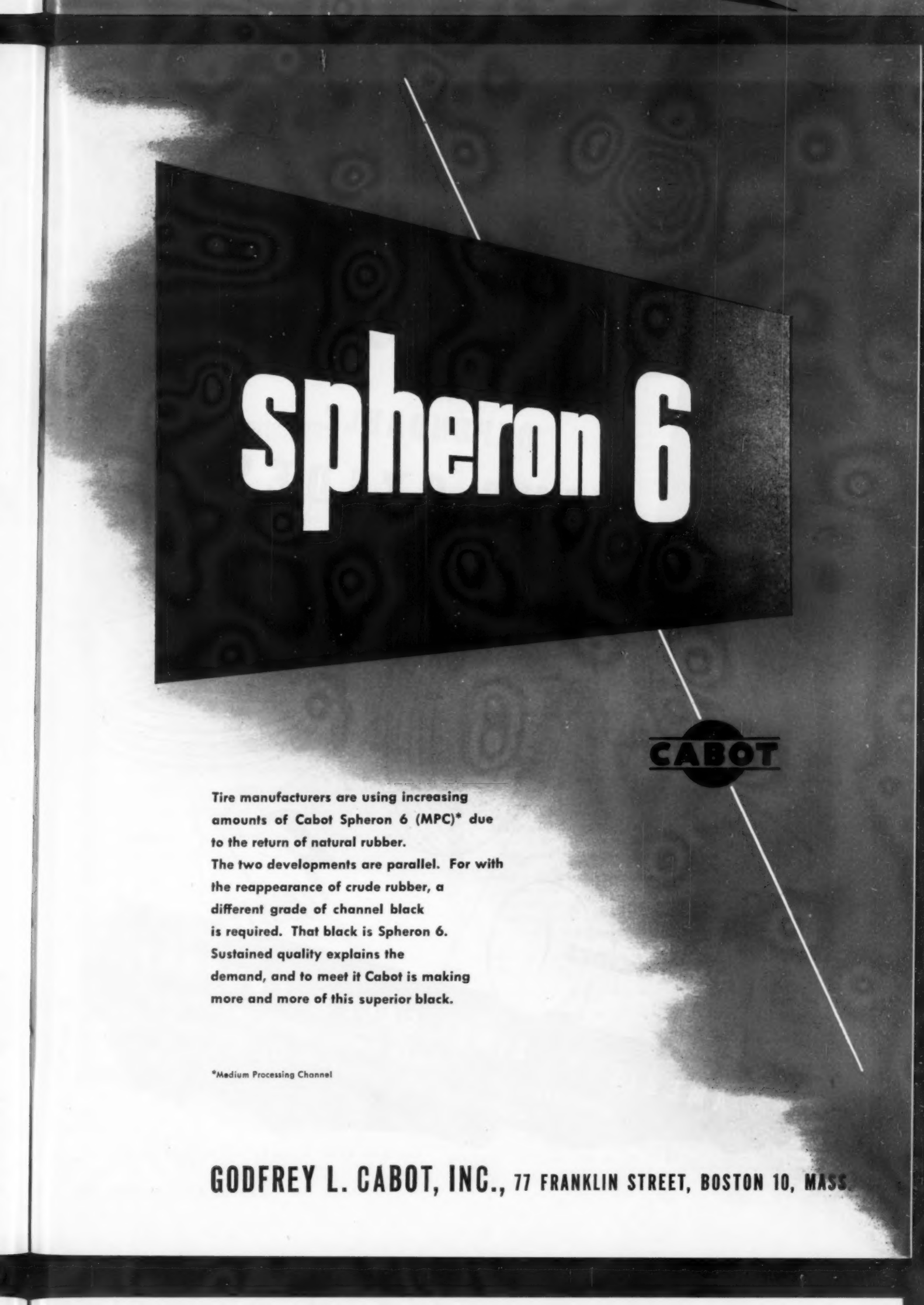
As long as there's a use for synthetic rubber—and we believe it's here to stay—we'll continue to give freely of the extra time and energy the job demands...so that *you* can be sure of what you're getting.

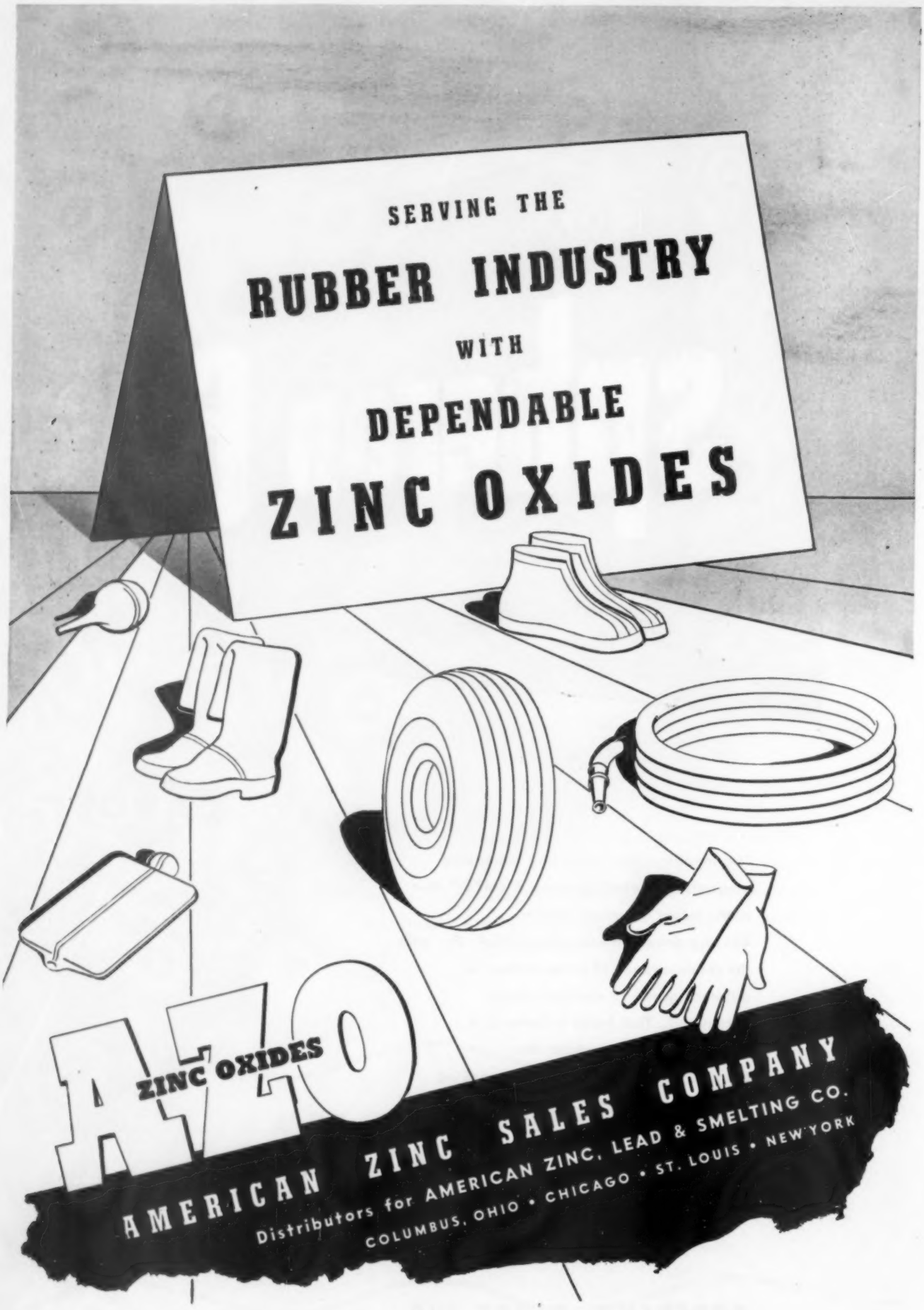
H. MUEHLSTEIN & CO. INC.

122 EAST 42nd STREET, NEW YORK 17, N. Y.

BRANCH OFFICES: New York • Akron • Chicago • Boston • Los Angeles • Memphis

WAREHOUSES: Jersey City • Akron • Boston • Los Angeles • Memphis


spheron 6
CABOT
Tire manufacturers are using increasing amounts of Cabot Spheron 6 (MPC)* due to the return of natural rubber.
The two developments are parallel. For with the reappearance of crude rubber, a different grade of channel black is required. That black is Spheron 6.
Sustained quality explains the demand, and to meet it Cabot is making more and more of this superior black.
*Medium Processing Channel
GODFREY L. CABOT, INC., 77 FRANKLIN STREET, BOSTON 10, MASS.


SERVING THE
RUBBER INDUSTRY
WITH
DEPENDABLE
ZINC OXIDES
AZO
ZINC OXIDES
AMERICAN ZINC SALES COMPANY
Distributors for AMERICAN ZINC, LEAD & SMELTING CO.
COLUMBUS, OHIO • CHICAGO • ST. LOUIS • NEW YORK

Rubber Compounders... save money... get quality!

EXAMPLE

Perbunan
+
Low cost plasticizer Nuso 55
=
High quality compounds that process readily ...with low costs!

Why spend extra money for expensive plasticizers? Check the formula above carefully. It offers you quality with economy using low cost plasticizer Nuso 55 with Perbunan. Consider them both for quality compounds with money saved!

PERBUNAN
REG. U. S. PAT. OFF.

THE SYNTHETIC RUBBER THAT RESISTS OIL, COLD, HEAT AND TIME

PROOF

Perbunan with Nuso 55

Recipe	
Perbunan	100.0
Zinc Oxide	5.0
Stearic Acid	1.0
Medium Processing Channel Black	50.0
Nuso 55*	20.0
Benzothiazyl Disulfide	1.0
Sulfur	2.0

PHYSICAL PROPERTIES	PERBUNAN 18	PERBUNAN 26
UNCURED STOCK		
Mooney Viscosity (ML) 1 1/2 minutes at 212 F	39	41
Extruded Appearance	Very smooth	Smooth
VULCANIZED STOCK: CURED 60 MINUTES AT 287 DEGREES FAHRENHEIT		
Rebound at 40 degrees Centigrade, per cent	47.7	54.1
Compression Set under Constant Deflection of 30 per cent for 22 hours at 158 F, per cent	44.0	35.5
Low Temperature Brittleness Test Passed at degrees Fahrenheit	—40	—40
Hardness and Stress-Strain Properties		
Original		
Shore Hardness	50	54
Tensile Strength, psi	2930	3350
Elongation, per cent	745	725
Modulus at 300 per cent Elongation, per cent	545	690
Aged at 212 degrees Fahrenheit for 70 hours		
Shore Hardness	62	62
Tensile Strength, psi	2630	3095
Elongation, per cent	315	340
Modulus at 300 per cent Elongation, per cent	2515	2515
Aged in ASTM Test Oil No. 3, at 212F for 70 hours		
Shore Hardness	36	53
Tensile Strength, psi	1225	2355
Elongation, per cent	370	395
Modulus at 300 per cent Elongation, per cent	835	1525
Volume Increase, per cent, on Immersion in:		
40 per cent aromatic test fluid SR-6 at room temp. for 48 hours	84	53
Gasoline test fluid SR-10 at room temp. for 48 hours	27	11
ASTM Test Oil No. 3 at 212 F for 70 hours	33	14

*Nuso 55 properties are: Specific Gravity 0.9509; Flash Point 390 F and Aniline Point 130 F.

STANCO DISTRIBUTORS, INC., 26 Broadway, New York 4, N. Y.; First Central Tower, 106 South Main Street, Akron 8, Ohio; 221 North LaSalle St., Chicago 1, Illinois; 378 Stuart Street, Boston 17, Massachusetts. West Coast Representatives—H. M. Royal Inc., 4814 Loma Vista Avenue, Los Angeles 11, California. Warehouse stocks in Elizabeth, New Jersey; Los Angeles, California; Chicago, Illinois; Akron, Ohio; and Baton Rouge, Louisiana.

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FROM THE CATALOG OF BARRETT RUBBER COMPOUNDING MATERIALS...

BARDOL*

Bardol is a distillate from coal tar. It is entirely liquid and easy to handle in the factory down to as low as 40°F.

Specifications

Specific Gravity @ 25C/25C		1.07 to 1.12
Specific Viscosity, Engler, 50 ml. @ 25C		4.0 maximum
Flash Point, Open Cup	deg. Fahr.	200 minimum
Insoluble in Benzene	% by weight	0.5 maximum
Distillation		
To 210 C	% by weight	1.0 maximum
To 235 C	"	10.0 maximum
To 300 C	"	30.0 to 60.0
To 355 C	"	60.0 minimum
Water	% by volume	1.0 maximum

Bardol is a softener and plasticizer of the solvent and swelling type. It is a particularly fine processing agent, especially for GR-S and crude rubber.

Available in: Tank cars and 50-55 gallon non-returnable steel barrels.

*Reg. U. S. Pat. Off.

Barrett

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

Fabric Uniformity Means Production Speed with Quality

Top production speed consistent with quality is always the watchword of rubber processors.

Mt. Vernon fabrics—better, tougher, more uniform than ever—are the answer to exacting production demands. Choice grades of cotton uniformly spun and woven into Mt. Vernon fabrics result in uniform absorption, strength, toughness and resiliency—easier, faster calendaring. For speed with quality—specify Mt. Vernon fabrics.

uniformity makes the big difference

Mt. Vernon-Woodberry Mills

TURNER HALSEY
COMPANY
Selling Agents
40 WORTH ST. • NEW YORK

Branch Offices: CHICAGO • NEW ORLEANS • ATLANTA • BALTIMORE • BOSTON • LOS ANGELES • SAN FRANCISCO

The ultimate in GLAZED CLOTH

to meet all requirements for all types of rubber sheeting, must

have superior surface gloss

• • •

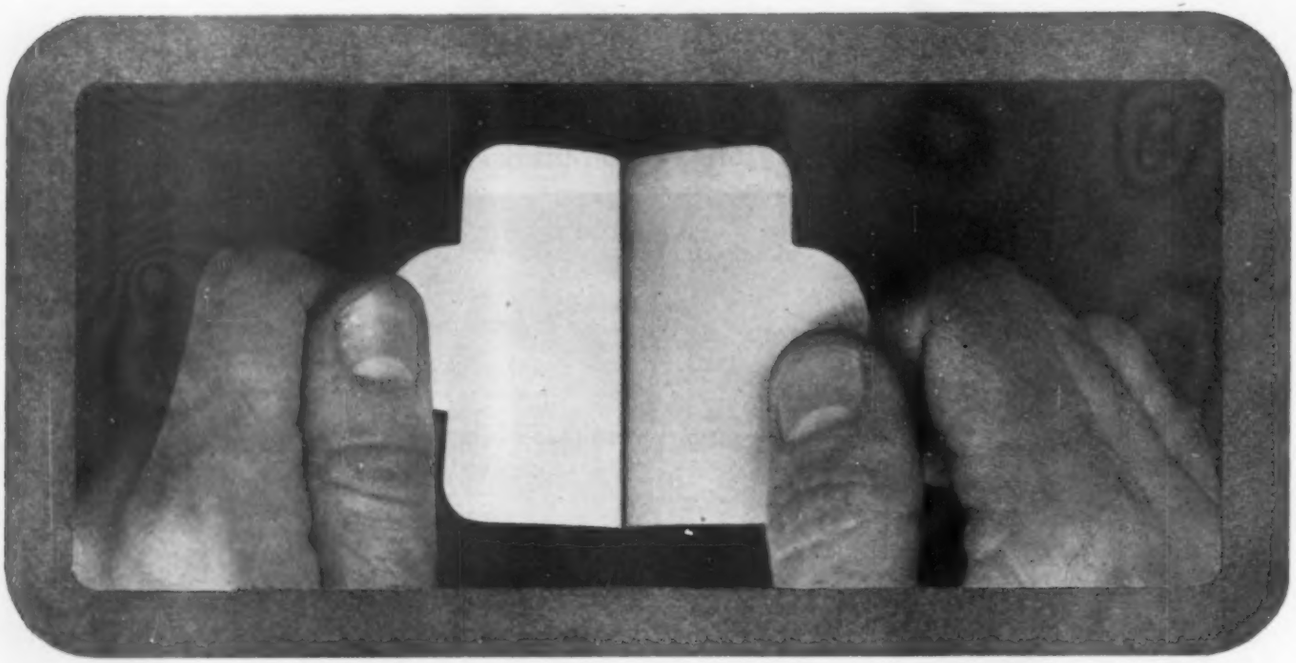
be of uniform caliper and tightly filled

• • •

carry minimum surface load

• • •

be non-flaking and pliable



The Name of That Cloth Is

BRATEX
RUBBER HOLLAND

It is available in 3 qualities and in 3 widths — 20" — 30" — 40" in 100 and 250 yard rolls or in special size rolls on order.

Write for Samples and Prices.

THE HOLLISTON MILLS, INC.

Processors of Cloths for Special Purposes

Dept. B1 Norwood, Massachusetts

RELEASE MOLDED RUBBER *Economically*

USE COLITE CONCENTRATE... *A High Quality Concentrated Liquid Mold and Mandrel Lubricant*

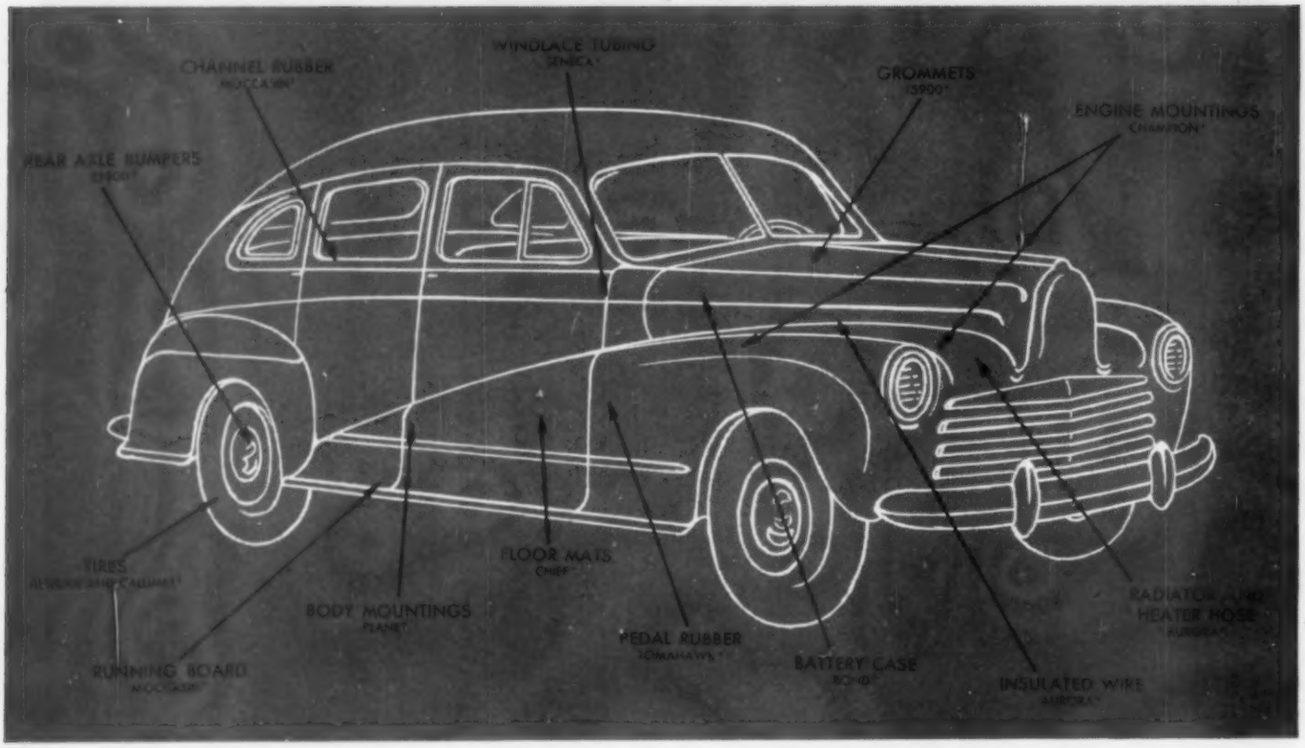
- Results in a shiny, satin-like finish.
- Never builds up on the molds.
- Is extremely *economical.*
- Is non-toxic, non-tacky, odorless.

Write today for further information on the Colite Concentrate way of removing cured rubber and plastics from molds

For brighter white goods, Colite D43D is recommended.

THE BEACON COMPANY
PURITY · UNIFORMITY · DEPENDABILITY
Chemical Manufacturers
97 BICKFORD STREET · BOSTON, MASSACHUSETTS

In Canada: PRESCOTT & CO., REG'D., 774 ST. PAUL ST. W., MONTREAL



Reclaimed Rubber Helped To Build Your Car!

Even rubber compounders are likely to underestimate the number of individual rubber parts used in the average automobile today. Only a few are shown—out of 200—or more.

Pequanoc reclaims are adapted to automotive needs which require:

1. Superior aging qualities.
2. Resistance to vibration fatigue.
3. Resistance to sunlight.
4. Scientifically controlled uniformity.
5. Price stability.

*We suggest PEQUANOC Reclaims as shown above—

PEQUANOC RUBBER CO.

QUALITY RECLAIMS FOR SPECIFIC PURPOSES

MAIN OFFICE and FACTORY

New England Representative
HAROLD P. FULLER
203 Park Square Bldg.
Back Bay, Boston, Mass.

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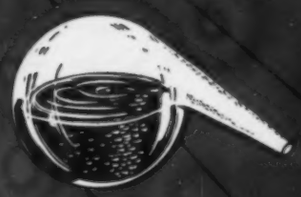
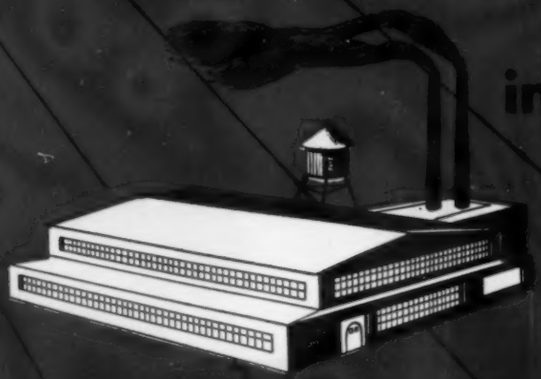
European Representatives
BURNETT & CO. (London) Ltd.
46 Herga Court
Harrow-On-Hill, Middlesex, England

BAKER

Plasticizers



chemistry +



industry =

DRAPE*

To impart drape, "hand" or flexibility to your unsupported films and coated fabrics, Baker Plasticizers are unusually effective.

Our Technical Service Department is always available to help you with your plasticizer problems.

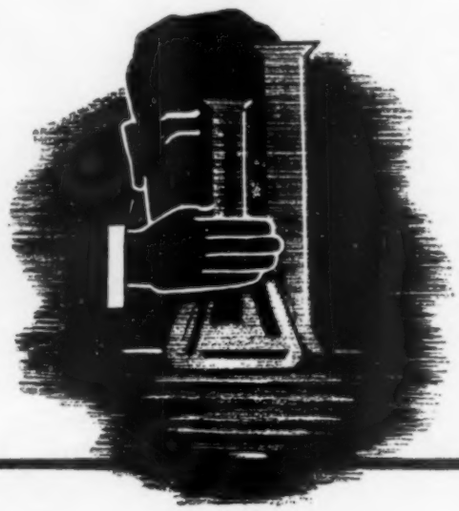
The BAKER CASTOR OIL COMPANY *Established 1857*

120 Broadway, New York, N. Y. Chicago, Illinois Los Angeles, California

Developing New Products?

Improving Old Ones?

CALL ON WHITTAKER



What grade of material will be best in that new product?

What's the best substitute for an unobtainable pigment?

We have stiff competition to buck. What's better and cheaper than what we've been using?

To help you answer just such questions, the Whittaker Research Division places at your service its extensive facilities and its accumulated knowledge of minerals, colors and pigments.

Whittaker research has helped solve lots of these problems. It has been most active when most needed. In answer to the serious need of the leather, optical, soap, and other industries, for instance, Whittaker discovered, developed and distributed *Valencia* pumice from the large deposit at Grants, New Mexico and this Whittaker product has proved superior to Italian pumice for all purposes.

Whittaker is manned and equipped to accept the challenge of your problems, too. Possibly one or several of the Whittaker minerals, colors and pigments may mean lower cost, faster manufacture or better quality in your products. Let Whittaker research help you find out. Write for full technical data, laboratory samples, or advice. For commercial quantities, place your order with Whittaker, fully assured of getting products that are laboratory tested for uniform high quality.

— Imported pigments and colors have returned —

206

WHITTAKER EST. 1890

Whittaker, Clark & Daniels, INC.

260 West Broadway, New York 13, N. Y. • Plant: South Kearny, New Jersey

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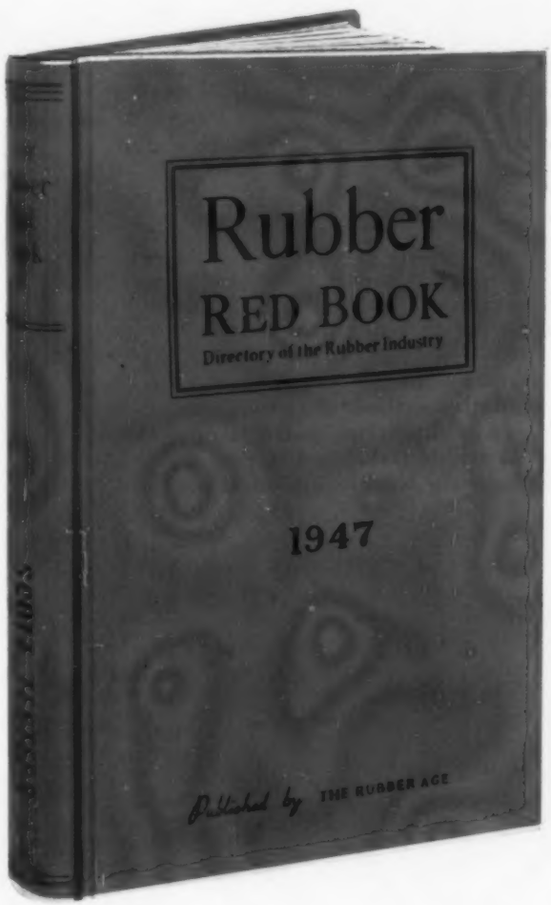
CHICAGO — Harry Holland & Son, Inc.
MEMPHIS, TENN. — L. E. Offutt Co.
PHILADELPHIA — R. Peltz Company
CLEVELAND — Palmer Supplies Co.
NEW ORLEANS — E. W Ortenbach
TORONTO & MONTREAL — Richardson Agencies, Ltd.

FIRST ANNOUNCEMENT

Plan Now for Space in the 1947 RUBBER RED BOOK!



The Sixth Issue of the RUBBER RED BOOK —the 1947 Edition—will be published in June, 1947.

If you budget your advertising in advance, do not fail to include this outstanding Directory on your list . . . it is *not too early* to reserve space now for the coming year in this essential advertising medium!

The last issue of the RUBBER RED BOOK—the 1945 issue—was the largest ever published, with a total of 696 pages and 242 advertisers. The demand for that issue was so great that inside of three months the complete edition, limited to 3100 copies by paper restrictions, was completely exhausted!

There is, accordingly, a tremendous interest in the 1947 edition as further evidenced by the hundreds of advance orders already on hand. We will spare no effort to bring out the 1947 issue early and the press run will be increased to meet the steadily rising demand.
You, as an advertiser, can capitalize on this situation by making sure as soon as possible that you are represented with ample space in the 1947 edition.

The RUBBER RED BOOK is without a doubt the most indispensable and widely used book in the rubber industry today! It is consulted daily by the industry's key men—buyers, technologists, plant executives and many others —as their primary source of buying information.

What better place then, to tell the story of your products and services than in effective display advertising in the RUBBER RED BOOK? Plan now to use adequate space in the 1947 edition!

Despite higher production costs, we are determined to hold the line on prices as long as possible; therefore there will be no change in basic advertising rates over the 1945 edition. Color charges are however necessarily somewhat higher. (See accompanying box for condensed rate data).

Reserve your space today! Your advertisement in the 1947 edition will pay you dividends until 1949!

1947 EDITION
Cost of Space

1 page	$100.	2 pages	$190.
½ page	55.	2 half pages	106.
¼ page	30.	2 ¼ pages	58.
Colors — Red	extra,		40.
Other Colors	extra,		60.
Bleed Pages	extra,		20%

Inserts — Not Accepted

For complete rates and mechanical requirements, write for rate card

Published by

RUBBER AGE

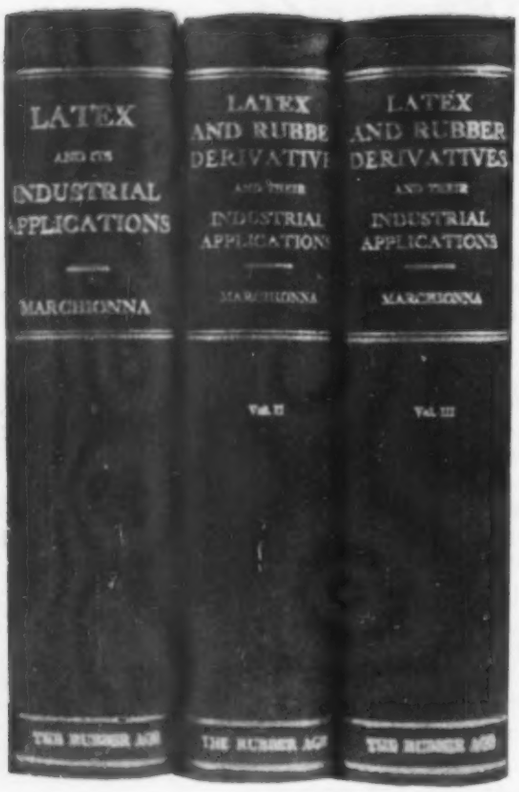
250 W. 57th St., New York 19, N. Y.

Announcing a 50% Reduction in Price on

Vols. 2 & 3 of

"LATEX & RUBBER DERIVATIVES"

By Frederick Marchionna



Vol. II & III — 1670 Pages
6 x 9 in.—Completely Indexed

An Indispensable Book for Every User of Latex—

Order Your Copy Today!

TO clear out the remaining stock of this valuable bibliography on Latex and Rubber Derivatives and their Industrial Applications, we are now offering the two-volume set for a new low price of $10.00 (former price, $20.00).

This reduction gives every latex user an opportunity to have this important reference book at a price within the means of all. The two volumes contain abstracts of all patents on Latex issued from July, 1932 to January, 1937 in the United States, England, France and Germany, and abstracts of all patents on Derivatives from the earliest developments through January 1937, in addition to abstracts of every essential technical article published during these same periods throughout the world—a total of almost 4000 abstracts!

As an added feature of great value, each chapter is supplemented by a complete summary of the subject covered, written by the author or other leading authorities, including such recognized experts as John McGavack, Philip Schidrowitz, C. L. Beal, D. F. Twiss, G. A. Richter, M. O. Schur, A. Szegvari, Harry L. Fisher, L. B. Sebrell and E. J. Morris.

New Low Price:

$10.00 (Postpaid)

(Add 2% Sales Tax for copies mailed to N. Y. City)

•

Published by

RUBBER AGE

250 West 57th St., New York 19, N.Y.

DIXIE 20
UNITED CARBON CO., INC.
CHARLESTON 27, W. VA.
NEW YORK • AKRON • CHICAGO

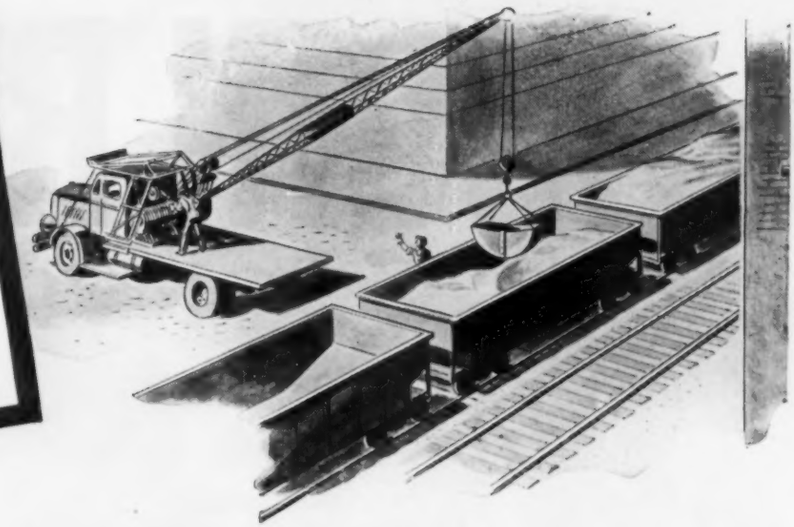
DIXIE 20

In SRF black there should be a perfect balancing of all the component properties contributing to rubber performance. UNITED with the "know-how" and engineering skill have achieved this perfect balance in DIXIE 20. With it you obtain ease and smoothness of processing, the proper degree of semi-reinforcement, low heat generation, maximum resiliency, best aging and non-staining. The wise compounder insists on DIXIE 20.

RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

Charleston 27, West Virginia



AVAILABLE NOW

BY THE TRUCKLOAD OR TRAINLOAD
$70,000,000.00 OF INDUSTRIAL CHEMICALS

ONCE-IN-A-LIFETIME BUYS!

- Acids
- Gas cylinders (all types)
- Dyes
- Plastic materials
- Solvents
- Sealing compounds
- Calcium chloride
- Dimethylaniline
- Copper naphthenate
- Synthetic and natural glues
- Printing inks (black and colors)
- Zinc Carbonate
- Picric Acid
- Welding fluxes
- Detergents and cleaners
- Water treating compounds
- Coal Tar
- Borax and boric acid
- Metal salts, oxide and hydroxides
- Pitches
- Rubber processing chemicals
- Gases and most other chemicals

All chemicals are subject to priority regulations. VETERANS OF WORLD WAR II are invited to be certified at the War Assets Administration Certifying Office serving their area and then to purchase the material offered herein.

Ready for quick sale in large quantity, many *at prices well below market*, are hundreds of items in the government's huge war surplus stockpile of industrial chemicals. If you need industrial chemicals of any kind, *in any amount*, it will pay you to get in touch with your War Assets Administration Regional Office. (Listed below). Among these chemicals are some at present in short supply from usual sources. If your regional WAA office does not have them, the Inter-office Product Location Service has been set up to locate them *fast* if available anywhere in the U. S. *All* items are ready for quick sale, under credit terms if desired. Write now—or use the coupon below.

FREE FACTS

War Assets Administration (address nearest Regional Office)
Please supply without obligation, prices, available quantities and locations of items written in below:

....
....
....

(Describe items wanted)

Name ..... Tel. No. .....
Firm .....
Address .....
City ..... State 155-6

Exporters: The War Assets Administration solicits your inquiries. Communicate with your foreign clients promptly.

WAR ASSETS ADMINISTRATION

GOVERNMENT OWNED SURPLUS

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Worth • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane • Tulsa

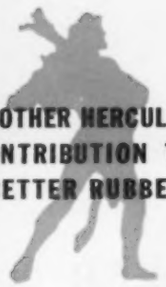
ROSIN RUBBER

- HIGHER TENSILE STRENGT
- GREATER ELONGATION
- SUPERIOR TEAR RESISTAN
- REDUCED FLEXCUT GROWT
- BETTER HYSTERESIS
- NON-DISCOLORING

IT PAYS TO KNOW *MORE* ABOUT

HERCULES

OPENS NEW MARKETS



ANOTHER HERCULES CONTRIBUTION TO BETTER RUBBER

Now the same tough, long-wearing rosin rubber that produces today's better tires brings its superior all-around physical properties to many rubber products made from non-black pigmented stocks.

Tests conducted at Hercules rubber laboratory, and by outside concerns, demonstrate that, in colors other than black, this new rosin rubber is superior to comparable stocks of regular GR-S in all the properties listed at left, and in their relative ease of compounding and calendering. The superiority of rosin rubber is largely due to the presence of resin acids produced by the coagulation of Hercules Dresinate* 731 in the rubber, resulting in better pigment dispersion and wider latitude in compounding recipes.

In addition, the rubber industry has developed modifications of the GR-S-10 rosin rubber recipe, which are non-staining and non-discoloring. These modifications open new fields to synthetic rubber, heretofore closed by the necessity of incorporating carbon black in GR-S compounds.

If you make rubber or rubber products, write for "Rosin Rubber—the Story of Dresinate 731."

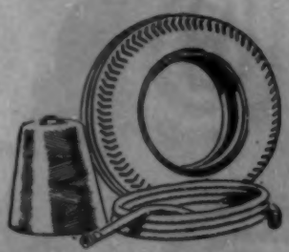
*Reg. U. S. Pat. Off. by Hercules Powder Company

CHEMICAL MATERIALS FOR THE RUBBER INDUSTRY

Hercules chemical materials for the rubber industry include:

Solvenol*...
A strong solvent for rubber, with a slow rate of evaporation. Widely used in rubber reclaiming.

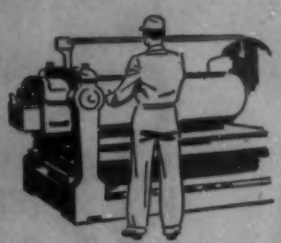
Staybelite* Esters...
Low-cost tackifiers, compatible with all synthetic rubbers. Valuable in pressure-sensitive adhesives.



Chemical Cotton...
Basis for the toughest high-tenacity rayon for automobile tires, hose, belting, and other rubber products.

Dresinate* 731...
One of Hercules' many resin derivatives, Dresinate 731 is the emulsifying agent used to make GR-S-10.

Nitrocellulose...
Hercules nitrocellulose and ethyl cellulose provide lacquers of maximum adhesion, durability, gloss, and color.



Staybelite* Resins...
Odorless, non-staining softeners for natural rubber.

FOR FURTHER DETAILS

HERCULES POWDER COMPANY
INCORPORATED
918 Market Street, Wilmington 99, Delaware

Please send your book on rosin rubber. We are interested in rosin rubber for_____

_____

Name_____

Title_____

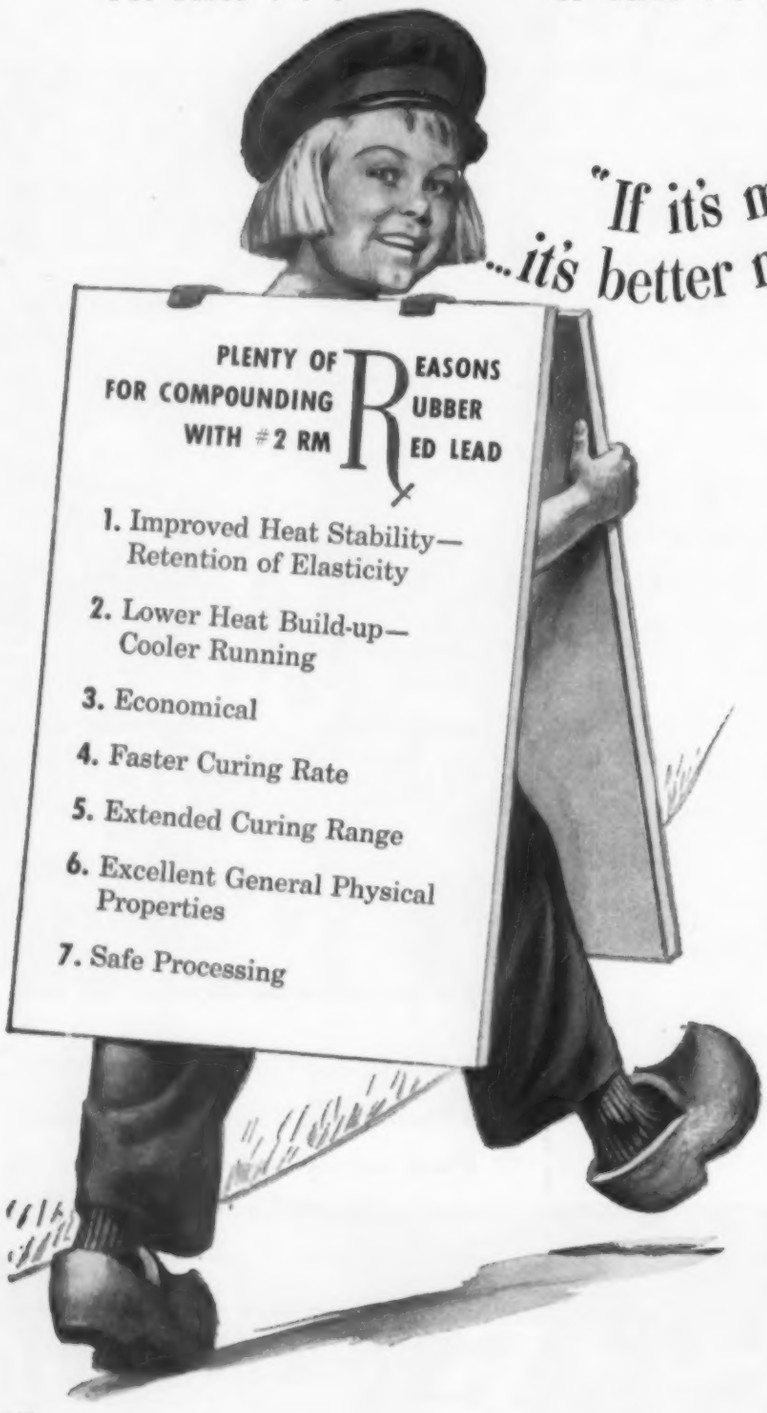
Company_____

Street_____

City_____ Zone_____ State_____

For Hose . . . or Tires . . . or Telephone Wires . . .

"If it's made with RUBBER ...it's better made with RED LEAD"


PLENTY OF REASONS FOR COMPOUNDING RUBBER WITH #2 RM RED LEAD
1. Improved Heat Stability—Retention of Elasticity
2. Lower Heat Build-up—Cooler Running
3. Economical
4. Faster Curing Rate
5. Extended Curing Range
6. Excellent General Physical Properties
7. Safe Processing

Most rubber products...from tires for wheels to rubber heels...are better products if they're made with Red Lead.

Exhaustive tests, and the working experience of users, show that compounding rubber with #2 RM Red Lead brings very real advantages.

Check the seven benefits listed at the left. All of them are important in tire manufacture, but most apply in other fields too...no matter whether you're working with GR-S, GR-S-10, GR-M, GR-A, GR-I, natural rubber or vinyl elastomers.

Technical literature and counsel on your specific application will be supplied upon request to the Rubber Division of our Research Laboratories, 105 York Street, Brooklyn 1, N. Y.

NATIONAL LEAD COMPANY

New York 6; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; St. Louis 1; San Francisco 10; Boston 6, (National Lead Co. of Mass.); Philadelphia 7, (John T. Lewis & Bros. Co.); Pittsburgh 30, (National Lead Co. of Pa.); Charleston 25, West Virginia, (Evans Lead Division).

City_____ Zone_____ State_____

STANMOCO
hydraulic toggle presses

EQUIPPED WITH KNOCKOUTS OFFER BIG LABOR SAVINGS

CLOSED

OPEN

Specifications

Platens	34"x 34"
Maximum Opening	14½"
Pressure	200 Tons

Operation: Manual or automatic through use of cycle timers.

Press designed for use with 750 pounds hydraulic oil pressure.

Press can be furnished with or without hydraulic pumping unit.

Special knockouts can be furnished to meet individual requirements.

Presses can be furnished complete with molds and knockouts for any special molding job.

Write for complete details

The Akron Standard Mold Co.
Akron — *The Established Measure of Value* — Ohio

One BIG FAMILY— and They're All Schrader

Schrader has devoted more than a century exclusively to the scientific study and manufacturing of a line of products to control compressed air.

How well Schrader has succeeded in reaching its objective is evidenced in the completeness of its line and its world-wide acceptance.

Schrader products are adaptable to various types of tubes, rims, wheels—on every type of pneumatic vehicle, from half ton jeeps to twenty ton giants.

As a result of this pioneering and leadership, Schrader has rightfully earned the title, STANDARD THE WORLD OVER.

SCHRADER PRODUCTS Make Tires Last Longer!

Schrader
REG. U.S. PAT. OFF.
PRODUCTS
CONTROL THE AIR

A CATALOG OF A COMPLETE TIRE SERVICE

If you have not received your copy of Schrader Catalog No. 48-A, write today to Box No. 240, General Post Office, Brooklyn 1, N. Y.

A. SCHRADER'S SON, Division of Scovill Manufacturing Co., Incorporated, BROOKLYN 17, NEW YORK

Which of these Rubber Chemicals will fit your Processing Needs?

TRITON R-100

An efficient, low-cost dispersing agent primarily recommended for latex compounding. Also useful for reducing viscosity or increasing solids content of polymer latices. TRITON R-100 is a salt of a complex organic acid, supplied as a free-flowing, granular product.

ACRYSOL GS

A completely synthetic thickener for use with aqueous solutions, dispersions or emulsions. ACRYSOL GS is free from the variability of natural products and provides an effective increase in viscosity that is much more permanent than is possible with many thickening agents. The sodium salt of polyacrylic acid, it is supplied at 15% solids in an aqueous solution.

TRITON WETTING AGENTS

TRITON W-30 — An effective wetting agent under mildly acid or alkaline conditions. Compatible with other anion-active materials such as sulfated or sulfonated products or ordinary soaps. It is an anion-active agent supplied as a 20% water solution.

TRITON N-100 — A water soluble, penetrating, wetting and emulsifying agent, it is an aryl alkyl polyether alcohol, containing no diluent. By virtue of its non-ionic character it is not precipitated by electrolytes and is compatible with both anion and cation active agents. It is soluble in a variety of organic solvents.

TRITON 77C — A synthetic detergent and emulsifier, similar to TRITON W-30 that can be used under more strongly acidic conditions than are recommended for TRITON W-30.

TRITON K-60 — An aqueous dispersion containing 25% solids, TRITON K-60 is a technical grade of cetyl dimethyl benzyl ammonium chloride. Of the Tritons, it is the only cation active type and will precipitate the common soaps or other anion active agents. It is an effective wetting agent under acid conditions.

Detailed information will be supplied upon request.

TRITON *is a trade-mark, Reg. U.S. Pat. Off.*

Represented by Cia. Rohm y Haas, S.R.L., Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities.

THE RUBBER CHEMICALS DEPARTMENT

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Manufacturers of Chemicals for the Rubber, Textile, Leather, Enamelware and other Industries . . . Plastics . . . Synthetic Insecticides . . . Fungicides . . . Enzymes

UNION PACIFIC RAILROAD SERVES SUN VALLEY

Re-opens December 21st

Sun Valley · Idaho

Its war duty as a Navy rehabilitation center ended, America's famous year 'round sports resort invites you to enjoy a winter vacation in Idaho's Sawtooth Mountains.

For experienced and intermediate skiers—a variety of fast open and partially timbered ski-runs. For beginners especially—but available to all—instructions by a selected staff of experts headed by Friedl Pfeifer. Special skiing events have been scheduled for winter season.

Electrically operated chair-lifts make it possible to enjoy a maximum of ski-runs.

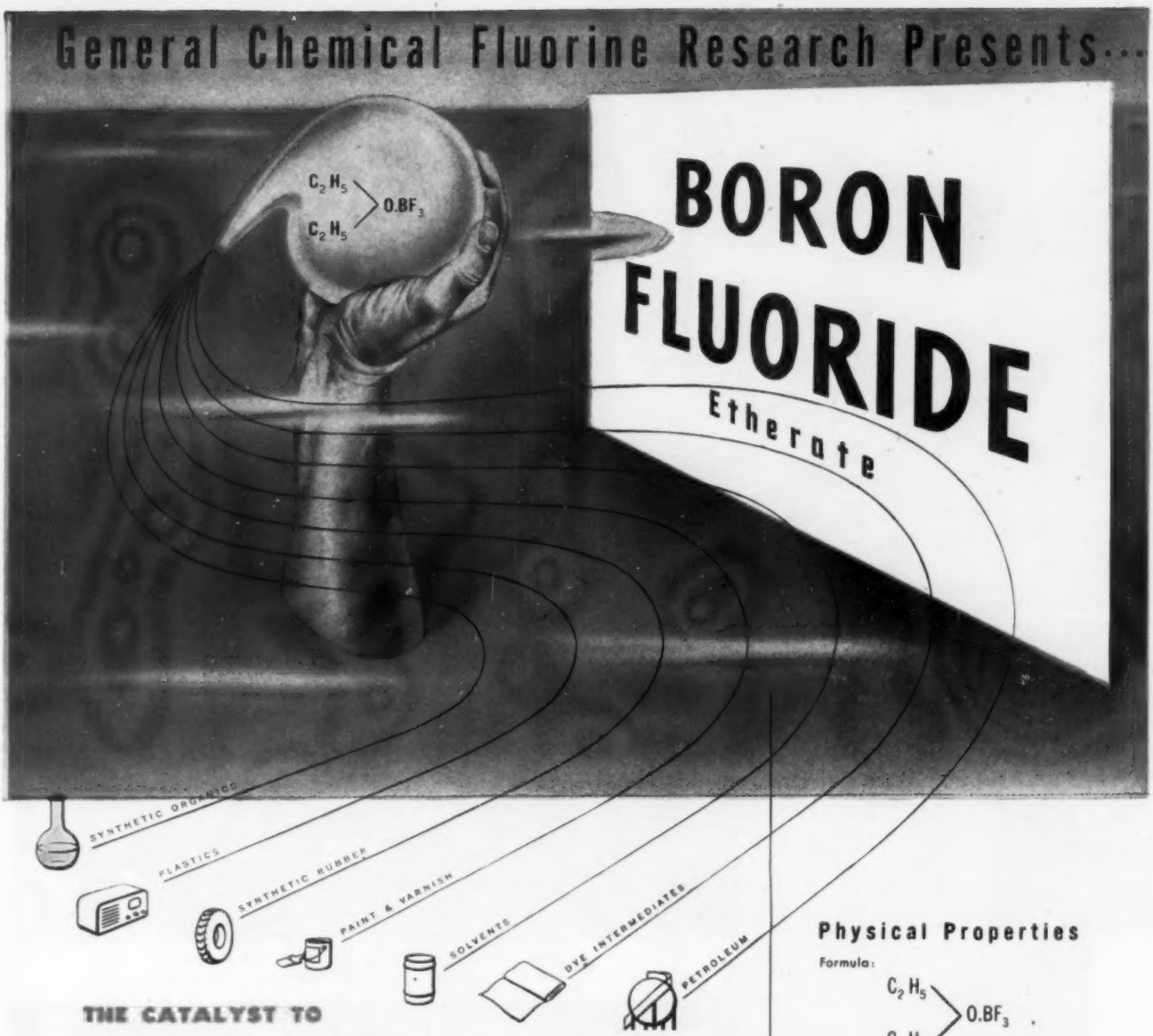
Other activities include skating, sleighing, and swimming in warm-water outdoor pools. And in evening hours—music and dancing.

Accommodations at a wide price range. For protection of guests, reservations must be confirmed in advance. Write or wire—

W. P. ROGERS, Gen'l Mgr., Sun Valley, Idaho

WINTER SPORTS UNDER A "SUMMER SUN"

General Chemical Fluorine Research Presents...



THE CATALYST TO CHART NEW COURSES FOR AMERICAN INDUSTRY

Boron Fluoride Etherate . . . valuable catalytic chemical of wide ranging potentialities for American Industry!

This new liquid fluorine compound has a multitude of uses. Technical literature—filling volumes—contains extensive data on the reactions catalyzed by BF_3 as well as by its complexes with other organic molecules. Repeated reference is made to its superiority to other catalysts since reactions are moderated and fewer undesirable by-products result.

Outlined at right are some of the principal applications for BF_3 as a catalyst. Perhaps they indicate ways in which you can utilize a chemical of these characteristics in your development or production program.

Boron Fluoride Etherate is commercially available in drums. For full information, contact General Chemical Company, Fluorine Division, 40 Rector Street, New York 6, N. Y. When writing, if you outline your proposed application for this new catalyst, the technical experts of our Fluorine Division can work with you toward an early solution of your problem.

Physical Properties

Formula: $(C_2H_5)_2O.BF_3$

Mol. Wt.	141.9
Melting Pt.	Less than —60°C
Boiling Pt.	125°C
Spec. Gr.	1.14 at 25°C
%BF_3	47.8% min.

Some of the Principal Reactions Catalyzed by BF_3

1. Polymerization of unsaturated compounds such as olefins, diolefins, vinyl ethers, fatty oils, and terpenes. The products may be solid polymers useful as plastics or liquids as in the bodying of drying oils for paints and varnishes.

2. Condensation of aromatic nuclei with olefins and diolefins, paraffins, and olefins, and aromatic nuclei or olefins with acids.

3. As a cyclizing agent for rubber.

4. As an esterification catalyst.

5. As a catalyst in the synthesis of aliphatic acids from alcohols and carbon monoxide.

6. As a promoter and dehydrating agent in the sulfonation and nitration of aromatic compounds.

GENERAL CHEMICAL COMPANY

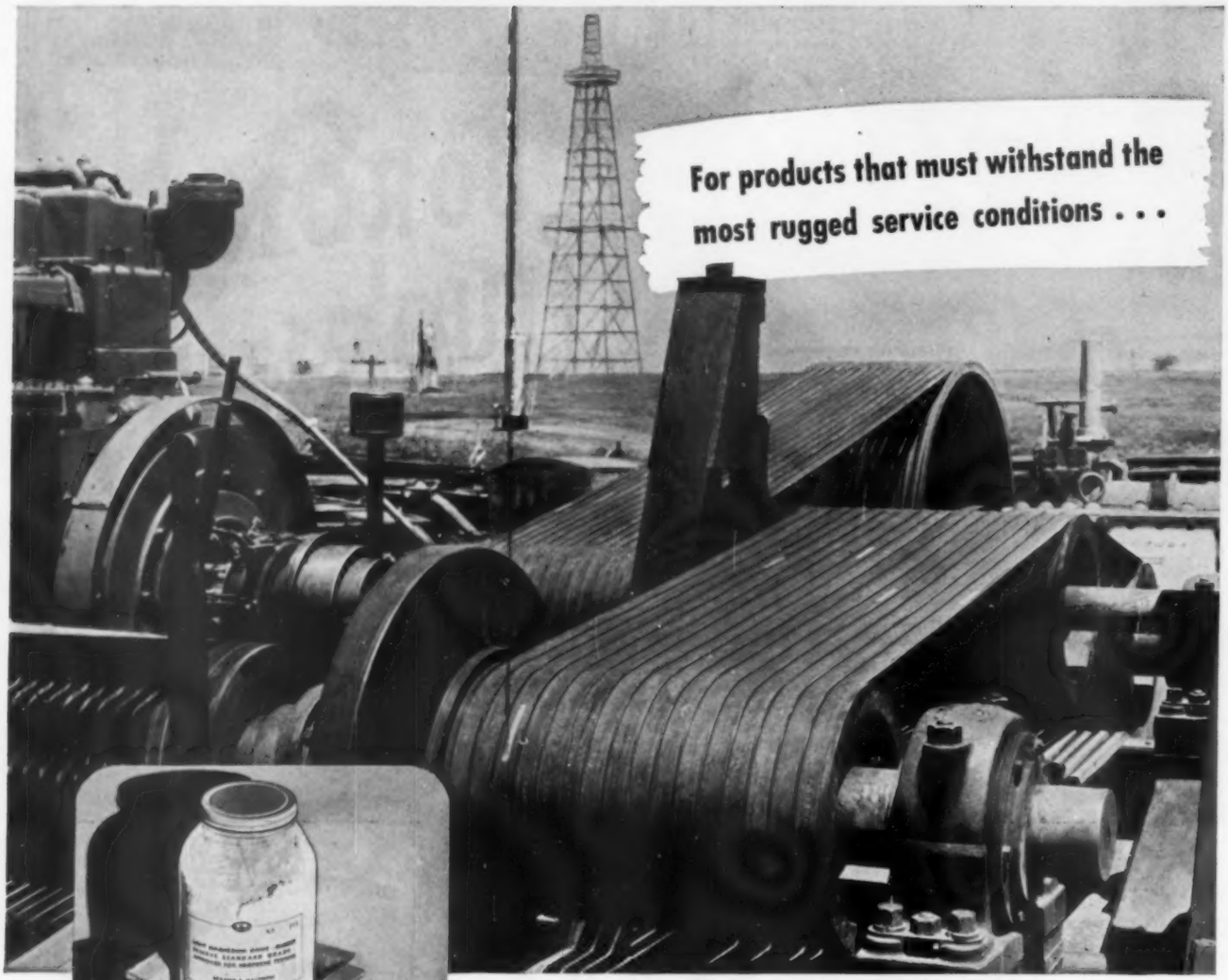
40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Albany • Atlanta • Baltimore Birmingham • Boston • Bridgeport • Buffalo • Charlotte • Chicago Cleveland • Denver • Detroit • Houston • Kansas City • Los Angeles Minneapolis • New York • Philadelphia • Pittsburgh • Providence San Francisco • Seattle • St. Louis • Wenatchee • Yakima (Wash.)

In Wisconsin: General Chemical Wisconsin Corp., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited
Montreal • Toronto • Vancouver

BASIC CHEMICALS
GENERAL CHEMICAL COMPANY
FOR AMERICAN INDUSTRY



● V-Belt drive on mechanical rotary drilling rig in oil field. Photo courtesy L. H. Gilmer Company, Phila., Pa.

R. R. C.'s approved standard.

neoprene compounders rely on

K&M LIGHT MAGNESIUM OXIDE

Exacting quality control . . . Uniform lightness . . .

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

One of America's oldest and most reliable makers of asbestos and magnesia products

ORDER K&M LIGHT MAGNESIUM OXIDE THROUGH OUR DISTRIBUTOR:

AMERICAN CYANAMID COMPANY

30 Rockefeller Plaza, New York 20, N. Y.

WITH SALES REPRESENTATIVES TO THE RUBBER INDUSTRY AND STOCK POINTS:

AKRON, OHIO, Akron Chemical Company
BOSTON, MASS., Ernest Jacoby & Company
CHICAGO, ILLINOIS, Herron & Meyer
LOS ANGELES, CAL., H. M. Royal, Inc.
TRENTON, N. J., H. M. Royal, Inc.

TIRE STORY OF THE YEAR

REPRINTED BY REQUEST

In ones, tens, hundreds, and thousands, requests for this booklet have been received from every branch of the tire industry. The first printing has been depleted and now, to meet the continuing demand, a reprint run has been made.

There's little wonder why it is so popular. With rayon as major news in tires, information was wanted on why rayon for tires grew from 12 million to over 200 million pounds per year... how rayon differs from other fibers used in tires . . . the advantages rayon gives in tires . . . how rayon is made. This booklet gives the answers to those questions and many more. Everyone who makes, sells or uses tires will find helpful information in this complete manual.

Be sure to get your copy **IT'S FREE!**

***TYRON rayon for tires**

*Reg. U. S. Pat. Off.

INDUSTRIAL RAYON CORPORATION
Cleveland 1, Ohio

Industrial Rayon Corp., Dept. A3
Cleveland 1, Ohio

Please send me my copy of "Rolling on Rayon."

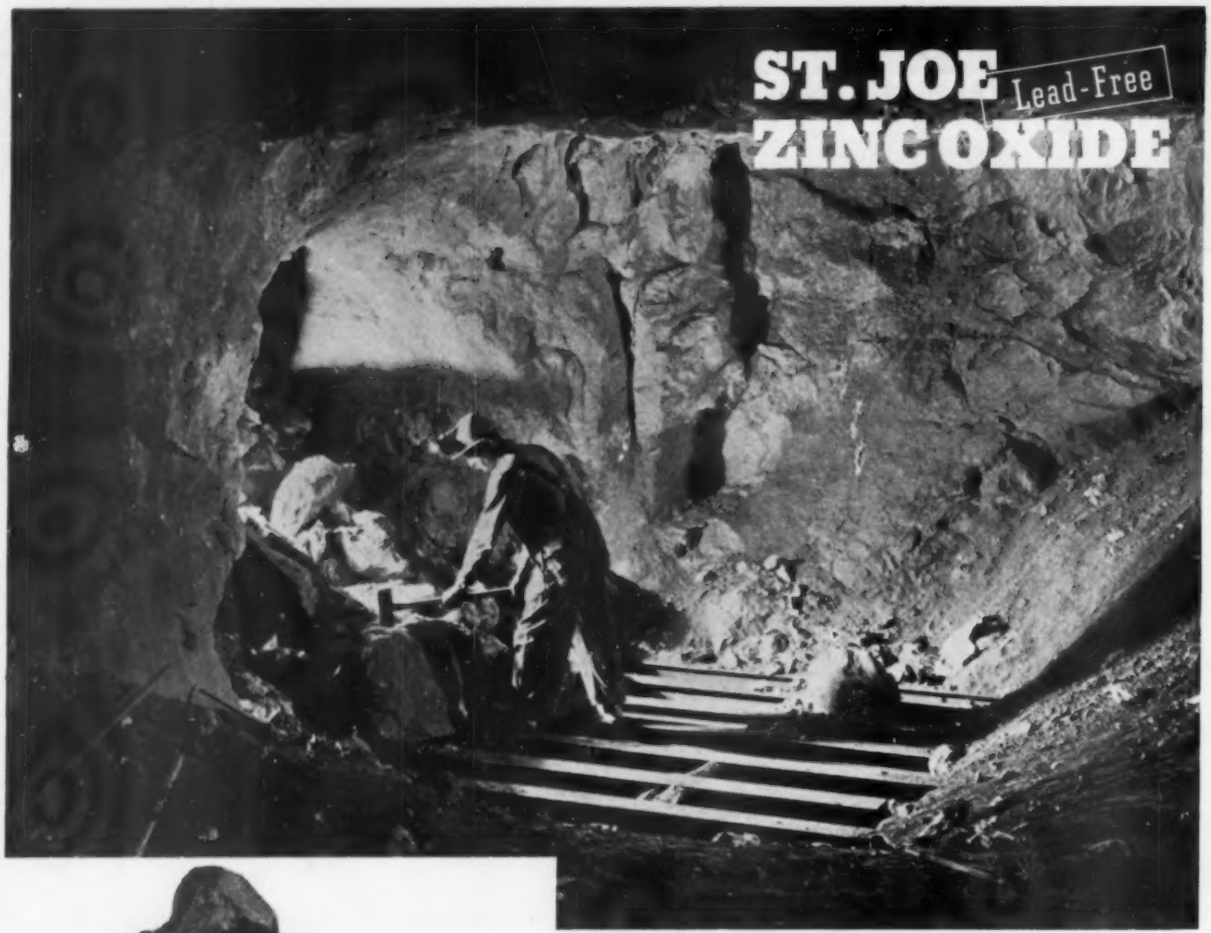
Name .....

Company .....

Address .....

City ..... State .....

In the Balmat zinc mine of the St. Joseph Lead Company the broken ore is screened by a steel "grizzly." The "grizzly" is the first screening operation. The broken ore drops between the steel beams and falls into the underground ore chute.



Speaking of particle size —

Shown here in the St. Joseph Lead Company's zinc mine at Balmat, N. Y., is the first screening operation in the intricate process which converts these large boulders of ore into St. Joe Zinc Oxide. This reduction of huge ore boulders into high-purity lead-free zinc oxides of the finest particle size is indeed a modern miracle of metallurgical precision and efficiency.

The Electrothermic Process employed in this Company's zinc oxide plant at Josephtown, Pa., is patented and used by the St. Joseph Lead Company exclusively in this country. Its flexibility makes it possible to control the purity and the size and shape of oxide particles to a degree which has made the various grades of St. Joe lead-free Zinc Oxides justly famous for their consistent uniformity.

ST. JOSEPH LEAD COMPANY

250 PARK AVENUE • NEW YORK 17 • ELdorado 5-3200

Plant & Laboratory: Josephtown, Beaver County, Pennsylvania

Announcing

CHAMPION CLAY.....

CHAMPION CLAY is an extra fine, hard, rubber compounding clay produced by the National Kaolin Products Company, at Aiken, South Carolina . . . New developments in the grinding and drying of this fine clay, in addition to greatly expanded facilities for mining and handling, now make possible fast service on practically unlimited volume requirements . . .

This quality product and manufacturing service are now represented exclusively on sales and distribution by the Standard Chemical Company, whose technical staff will provide complete cooperation on any compounding problem.

Stocks of Champion Clay are maintained at all Branch warehouses.

STANDARD Chemical Company

General Offices: AKRON 8, OHIO

New England: 335 Chamber of Commerce Bldg., Boston, Mass.
Mid-Atlantic: Broad Street Bank Bldg., Trenton, N. J.
Mid-West: 2724 W. Lawrence Ave., Chicago, Ill.
Pacific Coast: 1248 Wholesale St., Los Angeles, Cal.

For the *BEST* in Clay Specify CHAMPION

SYNTHETIC RUBBER & RESIN COMPOUNDS

Custombuilt

FOR YOUR PRODUCT OR PROCESS

A few Applications of GENERAL LATEX Product Development

Aircraft Cements
Carpet Backing
Can Sealing
Cable and Wire
Combining Compounds
General Adhesives
Hose and Belting
Impregnating Compounds
Pile Fabrics
Protective Clothing
Shoe Adhesives
Sizings

A practical approach to the use of synthetic dispersions in your product is to refer your problem to our laboratory. No matter what the process—coating, impregnating, or bonding—our experienced technical staff can compound the material best suited to your requirements. In the case of an entirely new product, we will work out all the details of manufacturing procedure—from pilot operations to commercial production in your plant. Why not talk it over with one of our technical representatives?

GRS latex types 2 and 3, normal and concentrated, available from stock.

A Complete Service to Manufacturers

RESEARCH • MATERIALS • ENGINEERING • MANUFACTURE

General Latex & CHEMICAL CORP.

666 MAIN STREET, CAMBRIDGE, MASS.

Agents for Rubber Reserve Company for storage and distribution of natural rubber latex. Distributors for Rubber Reserve Company for synthetic latex. Operators of the Government-owned Baytown, Texas, synthetic rubber plant in collaboration with the General Tire & Rubber Co.

Saving $3,000 A YEAR

SUN RUBBER-PROCESSING AID . . .

Produces Important Savings in Rubber-Boot Plant

One of the foremost manufacturers of rubber boots and overshoes reports a saving of about $3,000 a year after using a "Job-Proved" Sun processing aid.

Lower costs, easier handling, more uniform quality, and increased flex-crack-resistance were direct results of consulting with a Sun Engineer.

This is just one of dozens of modern rubber companies that have had outstanding success with the processing aids specially developed by Sun for the rubber industry.

For natural, synthetic, or reclaim rubber, Sun manufactures special products that speed up milling, eliminate blooming, and improve quality. These "specials" have been tested and proved in steady production on tires, tubes, sheeting, footwear, belts, hoses and other mechanical rubber goods. Call the nearest Sun office for full information on these "Job-Proved" products.

SUN OIL COMPANY · ***Philadelphia 3, Pa.***

Sponsors of the Sunoco News-Voice of the Air — Lowell Thomas

SUN

SUNOCO

INDUSTRIAL PRODUCTS

Get Rid of the "DUST NUISANCE"-
INVITE MAN POWER!

GLYCERIZED
(LIQUID CONCENTRATE)
LUBRICANT

. . . . **GLYCERIZED eliminates annoying "DUST" arising from the use of talc, soapstone, whiting or clay. A clean mill room, free from dust, is the goal of every rubber manufacturer.** ***Make your mill room a healthful, inviting place to work in by doing away with all 'dust'.***

. . . . **Banbury or mill mixed stocks may be dipped in a 2 to 5% water solution of GLYCERIZED LUBRICANT for 10 to 30 seconds and hung on racks to cool and dry. After 30 to 40 minutes, the slabs are cool and dry enough to pile. GLYCERIZED reduces the surface tension of the water and insures complete wetting of the surface of the slab. Adhesion is nullified!**

. . . . **Use GLYCERIZED in your extruding operations—as a mold lubricant—for coating mandrels and cores—belt drums—air bags—washing and finishing inner tubes—processing of insulated wire and cable—all with gratifying results.**

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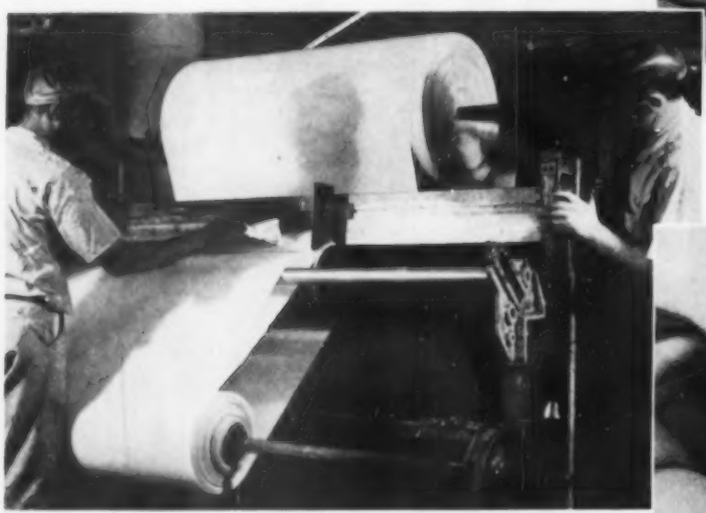
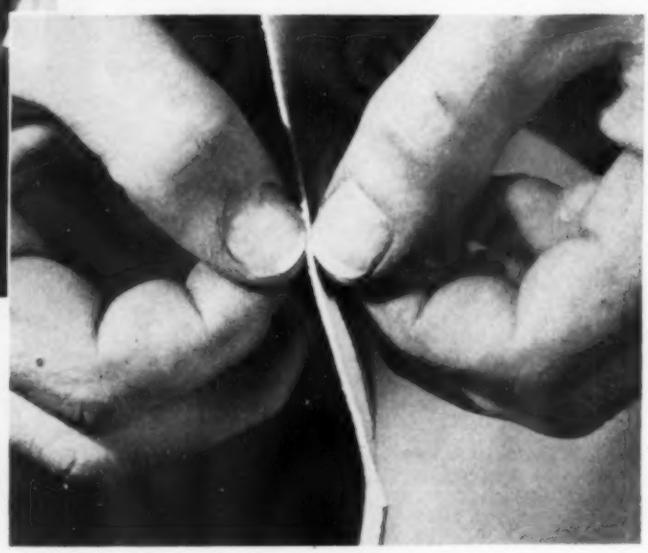


Wet Combining in process in same Can Drier operation. Note rolling bank of UBS Combining Cement at knife and high solids film deposit of sufficient depth to enable wet stick.



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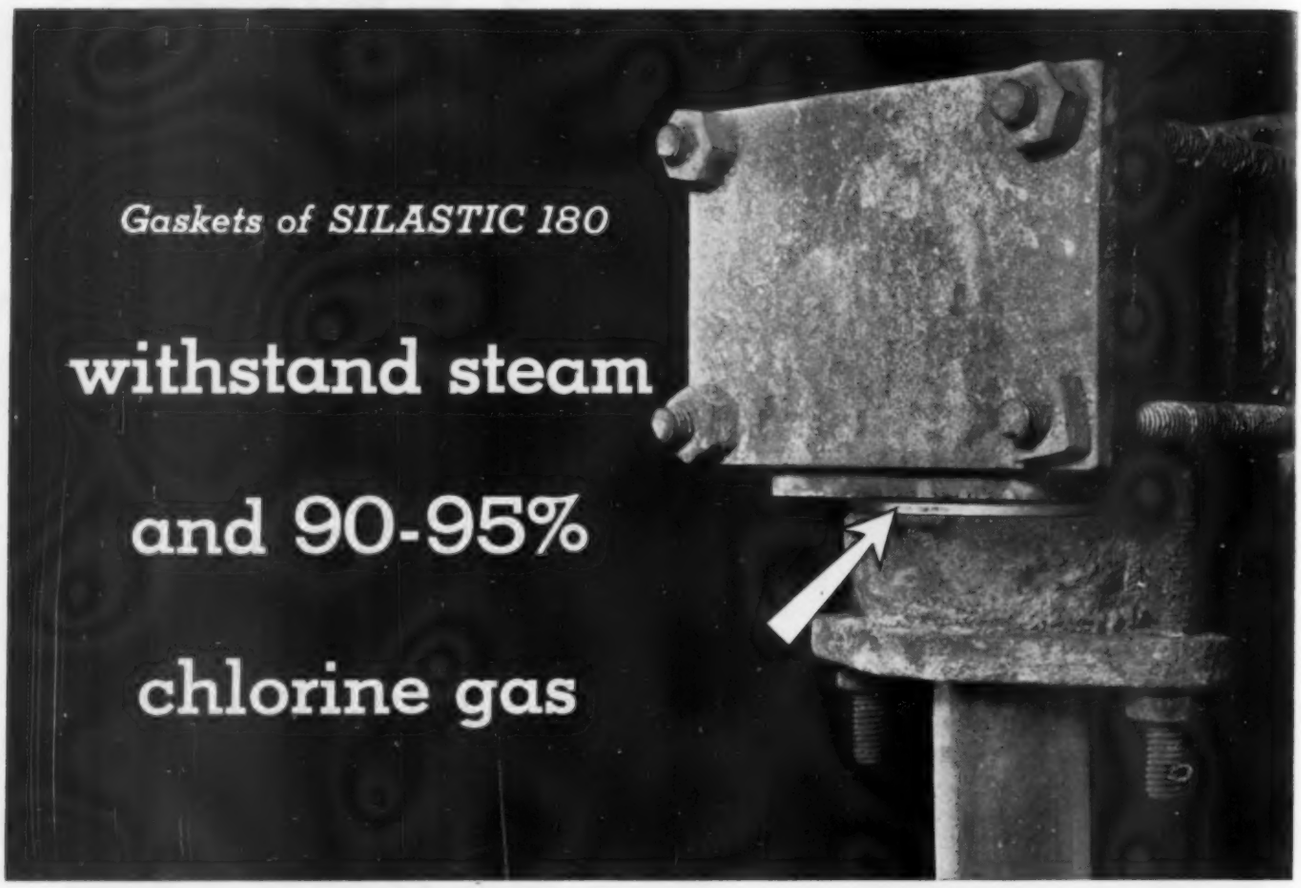

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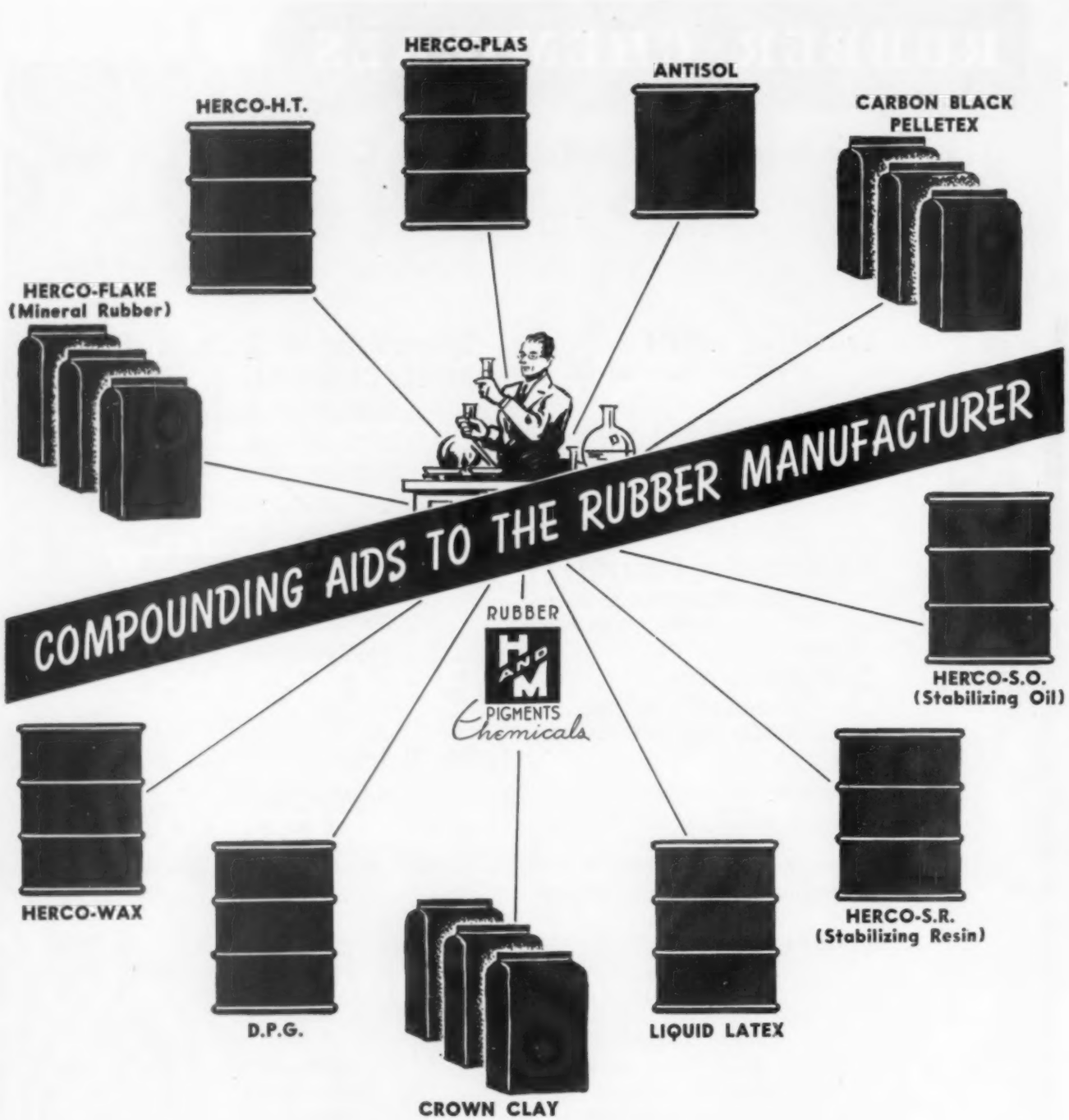

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			200%	300%	400%	500%			Room Temp.	100°C.
4	110	940	35	35	75	75	.38	22	27	9
7.5	1680	1020	115	190	230	305	.36	34	109	48
15	1870	810	190	265	380	495	.36	40	84	53
30	1820	710	270	390	505	700	.33	43	90	47
45	2080	735	270	385	540	770	.35	45	75	52
60	1940	705	305	420	570	800	.32	45	76	51
90	2110	750	310	385	540	730	.32	45	79	47

Time of Cure Min. at 45 Lb.	Goodyear-Healey Pendulum			Compression Fatigue (Goodrich Flexometer)*					Cut-Growth Resistance Tested at 70° C. Inches Failure	
	Indentation in mm.	Per Cent Rebound	Shore Hardness	Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C.	Dynamic Compression		1,000 Cyc.	8,000 Cyc.
							Initial	Final		
60	8.02	47.0	42	25.1	15'-5.4	27.5	10.0	14.6	.07	.58

* Test Conditions: 93 lb. Load. 0.25" Stroke. 100° C. Oven Temp.

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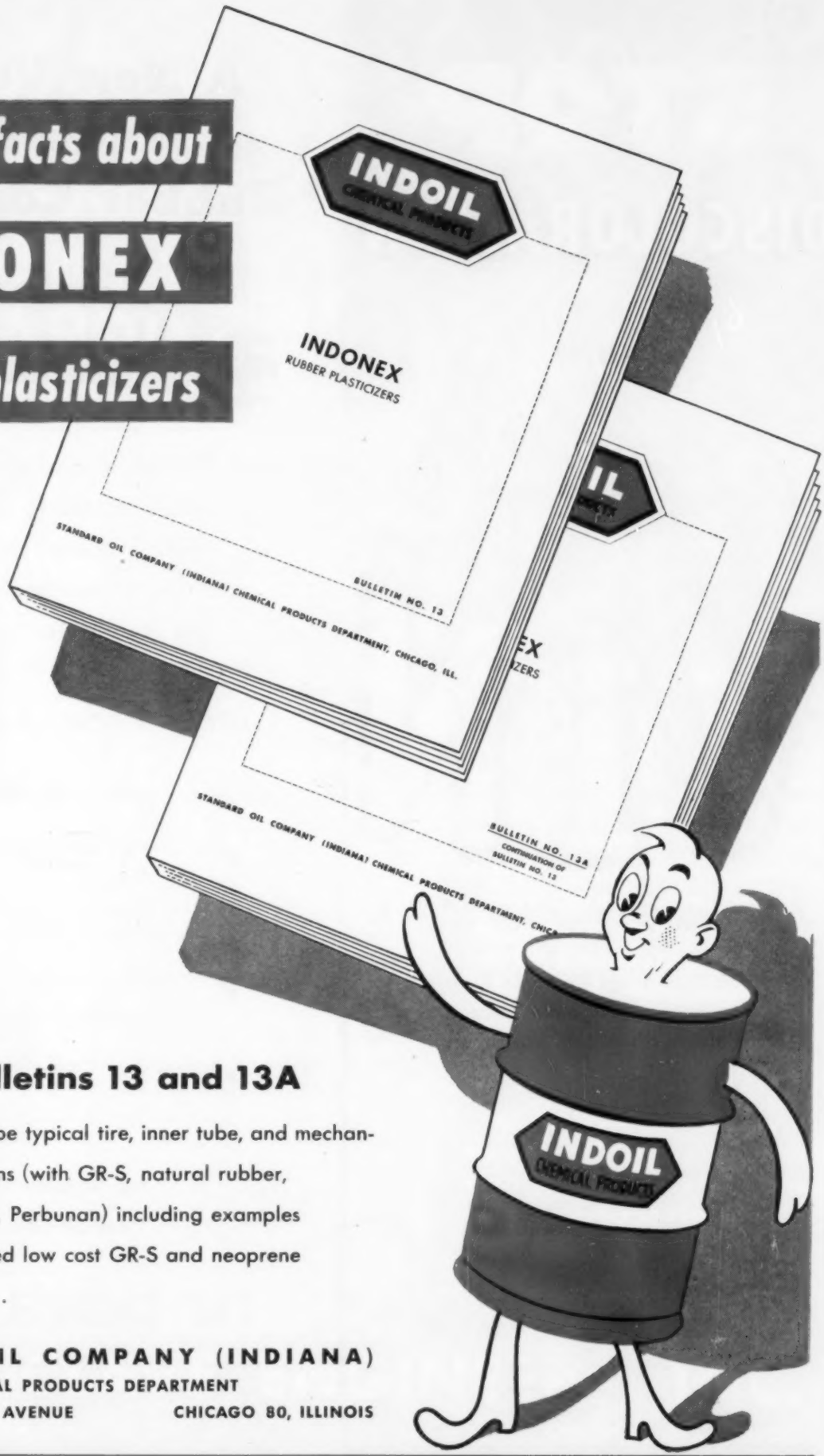

Send for Bulletins 13 and 13A

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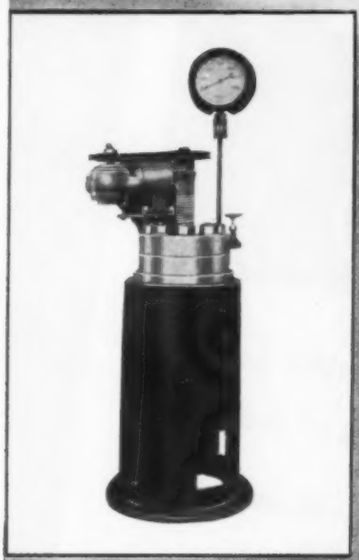

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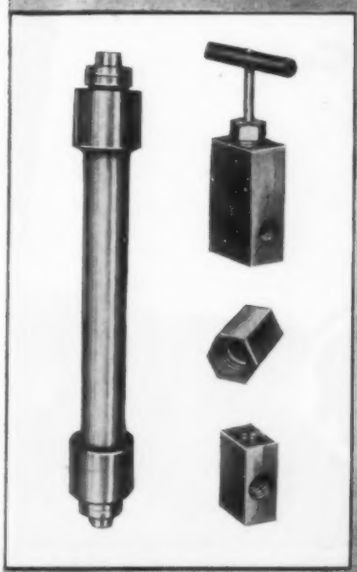

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VOLUME 60

NUMBER 2

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VOL 60, No. 2 **RUBBER AGE** NOVEMBER, 1946

The Physico-Chemical Aspects of Reinforcement

By GEORGE ANTONOFF

Chemistry Department, Fordham University, New York 58, N. Y.

THE object of this study was to explain the phenomenon of reinforcement in rubber resulting from the addition of various substances to it in the process of compounding. It was intended to correlate this phenomenon particularly with surface tension.

Natural crude rubber has characteristics of both liquids and solids. In some respects it behaves like a liquid. For example, it can freeze, this being one of the reasons why it is not of much use in its unvulcanized form. If it is brought back to ordinary temperatures, it does not regain its properties at once but only after several months of standing at such temperatures. There again it behaves like a liquid.

This behavior, apparently, belongs to the category of phenomena described by Nord *(6)* in the course of experiments on cryolysis. It is attributable to processes of aggregation or disaggregation, which may be reversible or irreversible, as the case may be. Similarly, Thiessen *(7)* considers fats and soaps as systems which tend towards an equilibrium as regards temperature and concentration only very slowly. The author has shown that in ordinary liquids very often the permanent state is attained only after several months of standing at a constant temperature *(1)*. This, apparently, is not in direct relation to viscosity.

Rubber is a complicated, very viscous mixture. One would therefore expect that much more time would be required to establish equilibrium. To watch the change in physical properties during the period when a liquid is on its way to the permanent state of equilibrium at a given temperature is very instructive. Some of these changes are quite abrupt and unexpected. Some of these changes are easily reproducible, some others are not, because it is not easy to reproduce the previous history of the liquid.

There can be no doubt that certain changes take place within the liquids which are not yet fully understood, and which according to conditions may have an influence on the final conditions. Standardization of properties of liquids leading to the formation of rubber is in itself a problem of paramount importance. The facts described are all of such character as to indicate similarity between the problem of rubber and that of liquids.

In some respects, however, rubber behaves differently than one would expect from a liquid. Thus, if one takes a film of rubber and applies a force to stretch it, the force applied increases with elongation. In liquids, however, a constant force is needed to produce elongation and ultimately rupture of the film. Moreover, when rubber is stretched heat is evolved (Gough-Joule effect), whereas stretching of a film of a liquid is accompanied by consumption of heat. These facts are not so surprising because rubber also has characteristics typical of solids.

Surface Tension of Solids

It was, therefore, interesting to see whether the method of measuring the surface tension of solids evolved by the author could be applied to the study of certain properties of rubber *(2)*. This method is based on the principle of Antonoff's rule, according to which, when two media are in contact with one another, the following relation holds true:

$$\gamma_{12} = \gamma_1 - \gamma_2$$

where γ_1 is the surface tension of one medium, γ_2 that of the other, and γ_{12} is the tension at the interface.

Let γ_1 be the surface tension of the solid. Let this solid be in contact with a fluid or semi-fluid, whose surface tension γ_2 can be varied at will. Then one can always adjust γ_2 so that

$$\gamma_1 - \gamma_2 = \gamma_{12} = 0$$

In such case, the surface tension of the fluid is equal to that of the solid, and it can be measured by the known methods.

The criterion for the condition $\gamma_{12} = 0$ is given by the fact that when $\gamma_1 > \gamma_2$ the fluid adheres to the solid, but if $\gamma_1 < \gamma_2$ the fluid does not adhere to the solid. Thus, one can see that the surface tension of natural crude rubber is less than that of water. Such is also the case with some specimens of vulcanized rubber. For these experiments hard rubber is very suitable as its surface can be well polished. Inserted into water and immediately taken out it remains dry and no film of the fluid adheres to it. But if one takes rubber used in tires, water adheres to the surface, indicating that its surface tension is higher than that of water.

The limitations of this method are due to the fact that it is difficult to find liquids with surface tension much higher than that of water in order to match solids whose surface tension is to be measured. However,

Figure 1.

this difficulty can be overcome by the use of pastes. These pastes are the same as ordinary paints made up of pigments and oils. In paints linseed oil, an oxidizable oil which easily dries in air is used. For the present purpose paints would be equally good, but their properties change with times. By replacing linseed oil with a non-oxidizable oil, such as salad oil or any other edible oil, pastes can be formed having the same properties which, however, do not change with time. Therefore, once prepared, they can serve indefintely.

A large number of pastes of different concentrations are prepared, and their surface tension measured by means of the apparatus shown in Figure 1. The apparatus consists of two rods—A and B—of about 1 mm. diameter. If the rods A and B are brought together and coated with the paste, the two rods will adhere to each other. Rod B carries a tray on which small weights, sufficient to produce rupture of the film, can be placed. The weight P thus applied, divided by twice the length L (because there are two surfaces) of the film, gives the breaking stress of the film per unit length, i.e., its surface tension is:

$$\gamma = \frac{P}{2L}$$

Rod A is provided with two supports on which rod B falls when the weight applied causes rupture of the film.

In practice it was found more convenient to have the apparatus in the form shown in Figure 2. A small table (A) carries a rod (C) made of thin glass with its two ends bent at right angles and fixed on the table's surface. Another glass rod (B) is bent into a quadrangle bearing the tray for the weights. The horizontal part of rod (C) and the upper horizontal part of rod (B) are held together by the paste and rod (B) drops on the table when the applied weight exceeds the breaking stress of the film. The frame of rod (B) is of a length exceeding that of the table, so that there is no contact between them and no friction during the fall of rod (B).

The vertical front part of the table bears two drawing pins (D) holding a glass plate (E) in front of the apparatus to protect it from breath, as moisture seriously affects the results.

Experiments with Pastes

A pigment, say carbon black, is taken, and mixed with an edible oil in a porcelain mortar. For example, 20.00 gr. of carbon black are mixed with 24.90 gr. of oil (30 cc. of oil of sp. gr. 0.83). Thus, 44.9 gr. of the mixture contain 20 gr. of carbon black, i.e., 44.5% of carbon black per 100 gr. of mixture. With this paste the two rods are coated until they adhere to one another. Weights are then placed on the tray. When the approximate weight necessary to produce the rupture is known, the experiment is repeated 5 or 6 times. Although individual weighings may differ somewhat from one another, the average gives a value which can be reproduced by another set of weighings with considerable accuracy. The part containing the tray is weighed previously. In the experiments described, it was found to be 0.51 gr.

The average of 5 experiments gave 11.00 gr. as the weight producing the rupture of the film. The length of rod C was 7.8 cm.; thus, $2L = 15.6$ cm.; and thus, the total weight equals $.51 + 11.00 = 11.51$ gr., or 0.735 gr. per unit length. If the mass in grams is multiplied by the acceleration of the force of gravity, one gets the weight in dynes, i.e., $0.735 \times 981 = 720$ dynes per cm., which is the surface tension of the paste.

To obtain a curve of the surface tension of this paste for various concentrations, a part of the paste remaining from the previous experiment is weighed, and mixed with more oil. In the experiments described, 20.99 gr. were weighed. They contained 9.35 gr. of carbon black. Then 2.54 gr. of oil were added and mixed. Grinding was carefully avoided, its purpose already having been accomplished in the preparation of the initial mixture of 44.5%. By adding 2.54 gr. the newly-formed mixture was reduced to 39.7%. After each experiment both rods are carefully cleaned with a piece of cotton. The new paste of 39.7% applied to the cleaned rods gave 570 dynes per cm. as the surface tension value. The result is represented by curve 1 in Figure 3. Another black was investigated in a lower concentration range because above 30% the paste became too stiff (curve 2 of Figure 3), while in another series of experiments the reinforcing effect of the tested black showed itself only at a much higher concentration (curve 3).

The concentrated pastes may become very viscous. The temperature coefficient of viscosity being enormous (in some cases about 25%), it sometimes is more satisfactory to work at a slightly elevated temperature. The temperature coefficient of surface tension, on the contrary, is small, and does not exceed 1%. It should be pointed out, however, that if a paste is stiff it by no means indicates that its breaking stress is high. The viscosity, as a matter of fact, has very little effect on the breaking stress.

Relative to stiff pastes, one can observe that their

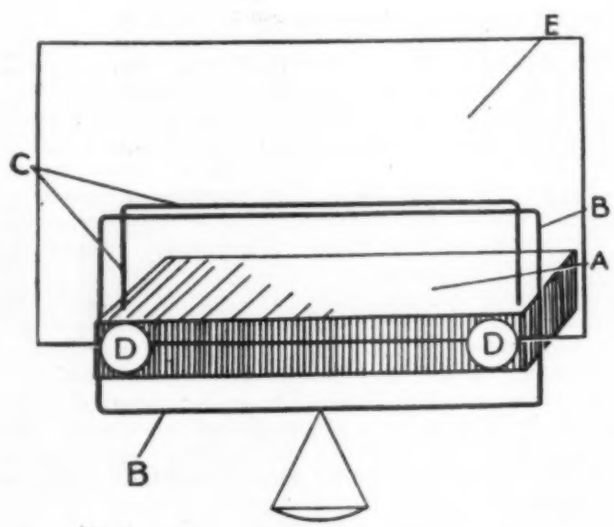

Figure 2.

breaking stress diminishes if many weighings are done successively with the same paste on both rods. This effect may be due to electrification, or it may be of a thixotropic character. Although the differences between individual experiments increase in stiff pastes, the average values fall on a perfectly smooth curve. For this reason, they were accepted and no further attention was paid to this phenomenon.

Measurement of Surface Tension

The pastes described are very suitable for measuring the surface tension of transparent solids, such as glass or rock salt. For glass, a capillary tube with a diameter of about 2 to 3 mm. can be used. By forcing pastes of different concentrations through the capillary it will be noted that pastes having lower surface tension than the glass will leave a film on the glass. If, on the other hand, the surface tension of the paste is higher than the glass it does not wet the glass of the capillary and descends without leaving a trace behind. The values of surface tension thus obtained are perfectly reproducible with pastes made of entirely different material. There will, however, be a marked difference between different varieties of glass. For instance, the figure for lead glass will be distinctly different.

For crystals, such as rock salt, the same method can be applied. A hole is bored with a drill, through which the paste can easily be forced by suction. By this method, it can be shown that in some crystals the surface tension measured in different directions is not the same.

The method described will operate only if the paste fills a capillary tube. Since the paste is viscous, a large capillary is recommended. However, it must not be too large, because if a paste is forced through too large a tube by means of suction, the air will create a hole in the paste and go completely through the tube, leaving a thick layer of paste on the walls. The diameter of the tube must therefore be such that the capillary forces make themselves felt. Thus, it was found that for glass $\gamma = 130$ dynes/cm., and for rock salt $\gamma = 315$ dynes/cm.

The method as described can only be used for transparent substances. However, it can be modified in such manner as to be suitable also for opaque substances. To this end a rod of the substance in question must be prepared with a well polished surface, and the rod inserted

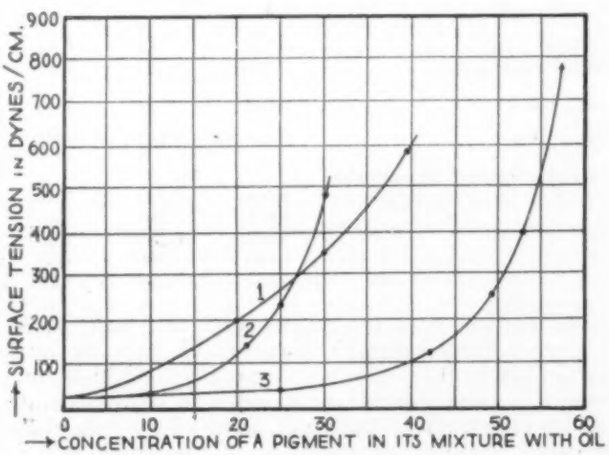

Figure 3.

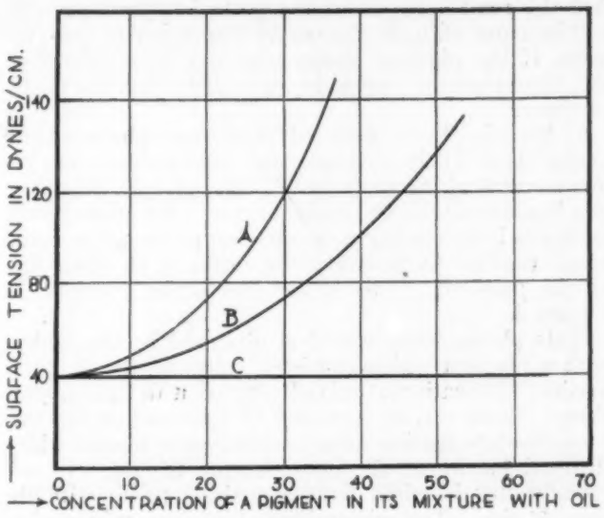

Figure 4.

in the paste. A plate of some kind, such as a glass plate, must be put on the surface of the paste with a circular hole in it of a diameter which exceeds somewhat the diameter of the rod. This plate must be held in position by weight or be fixed in position in some way. The rod, inserted in the paste, must be guided so as to remain equidistant from the walls of the glass. It must be lifted steadily and slowly, not by hand. The paste then is held by capillary forces and yields only to a superior force. The rod will ascend, coated with the film, if its surface tension is higher than that of the paste.

By this method the surface tension of solids can be measured satisfactorily if the solid in question is available in the form of a rod with smooth surface and exact dimensions.

The Problem of Reinforcement

It is sometimes observed that certain substances with a pigment cause reinforcement of the system, i.e., one having an enormous surface tension (Figure 3). Such materials, in the author's experience, can be found among substances with high molecular weight. It is known that some properties, such as lubricating or detergent characteristics, can only be observed in substances having not less than 8 carbon atoms in the molecule. Apparently something similar applies in the case of reinforcement. The author found these properties exhibited by oils, as well as other substances, and concentrated his attention on the oils. Apparently, rubber belongs to the same category because its behavior from the standpoint of surface tension is analogous. Thus properties of paints, or mixtures of pigments with oils, can throw considerable light on the problem of reinforcement of rubber, and they will be treated somewhat in detail.

If a given pigment is mixed with an inoxidizable oil, as mentioned above, and the surface tension of its pastes of different concentrations determined as described above, the results indicated by curve B in Figure 4 will be obtained. If the same pigment is subjected to a treatment intended to reduce the particle size, the effect will be such that the curve will be steeper, as indicated by curve A. Thus, it is apparent

that the reinforcement of the paste in dynes per cm. will increase with the degree of dispersion of the pigment, if the pigment shows tendency to reinforce at all. The pigment cannot be separated from the oil by pressure.

It has also been observed that some pigments, no matter how finely divided they are, produce no reinforcement of the paste at all. The surface tension of oils is about 30 to 40 dynes per cm. By adding such pigments in increasing concentration pastes are secured whose surface tension does not differ at all from that of the pure oil. This is represented by curve C in Figure 4.

This phenomenon was first observed by the author with a pigment which consisted substantially of ultramarine. When it was mixed with oil it did not appear shiny. However, on standing, oil appeared on the surface. Surface tension measurements gave figures which differed hardly at all from that of the oil. It was thought that it might have something to do with the particle size. The mixture was therefore subjected to prolonged grinding which, however, produced no effect. The oil can be easily separated from the pigment under pressure. Results of this kind have been also observed with certain varieties of carbon *(3)*.

Similar phenomena of this kind are known in colloid chemistry and are generally attributed to electrical charges. Thus, there are sols in which the colloidally suspended matter will rise together with the dispersion medium in a capillary. In some others, there will be separation and only the medium will rise. As one example, colloidal graphite may be mentioned. Suspended in water it gives a sol which rises together with water in filter paper (Aquadag). The suspension of colloidal carbon in oil (Oildag) gives a sol in which oil alone rises in the capillaries of filter paper.

The described pastes behave similarly, except that when they are concentrated they have the characteristics of gels. Many gels differ from sols only in concentration or in degree of dispersion. In the case where there is reinforcement the dispersion medium is strongly attracted by the disperse phase, and the latter becomes strongly solvated, the particles become surrounded by "shells" of the medium, viscosity increases until the system becomes rigid, and gelation results. In such case, electrical forces result due to dipole moments. Depending on their magnitude and orientation, molecular forces make themselves felt, and in this fashion the surface tension of the system may reach such high values as 900 dynes per cm. This value is of the order of magnitude which may be characteristic of a metal, but not of any other substances known.

Critical Phenomenon in Pastes

At lower concentrations of the pigment, the pastes under discussion are fluid. At high concentrations they are plastic, i.e., they keep their shape. Once a specific number of concentrations for any given pigment is prepared, the region of concentrations where the change from the fluid to the plastic state occurs can easily be determined. It will be noted that the change is sudden. It should be pointed out that the concentration at which the change takes place is only definite for a given paste. The author has previously outlined a method of observing the critical zone in the region when the fluid suddenly becomes plastic by following the change of other properties *(4)*.

If the curve indicating the change of breaking stress is taken as a function of concentration, the curve is smooth, as shown in Figure 3. However, following up the region in which the pastes change from the fluid to the plastic state, the curve will be as shown in Figure 5. With the decrease of concentration of the pigment the surface tension gradually decreases. With further decrease of concentration of the pigment the curve remains horizontal until point A is reached and subsequently begins to fall again. The horizontal part of the curve seems to be an indication that aggregation of particles is taking place here. On the right hand side of A, the system is plastic. To the left of it, the paste is fluid. If the same concentrated paste is subjected to further grinding and then diluted to give pastes of various concentrations the critical phenomenon will also be observed but it will be shifted in place.

The grinding, unless it can be standardized in some way, introduces an indefinite parameter in the problem, and for this reason the concentration should be given in an arbitrary scale. Apart from this, the phenomenon is perfectly reproducible. For these experiments various reinforcing pigments have been used, but most of the experiments were performed with titanium white.

Physical Properties of Pigments

Some specimens of carbon were prepared by carbonization of carbonaceous matter and subsequent grinding by mechanical means. On the other hand, carbons with varying properties were prepared by colloidal methods, and subsequent carbonization. The products of this category, like all matter which pass through colloidal state, hardly need any grinding in order to be presented in a state of extreme division.

There exists a theory that there is a definite relation between particle size and the ratio between the apparent density Δ and real density δ. By apparent density is understood the mass of the powder per unit volume; the real density is obtained by suspending a given mass in a liquid and measuring the actual volume displaced by the mass *(5)*. The ratio $\frac{\Delta}{\delta}$ is said to be a measure of fineness and it varies inversely as the reinforcing power of the pigment in rubber. The following table shows these relations for a number of varieties of carbons with which the author has experimented:

	$\frac{\Delta}{\delta}$	Δ (*apparent density*)	δ (*true density*)
Carbons	0.348	0.559	1.59
Mechanically ground	0.364	0.569	1.56
Lamp black	0.089	0.171	1.92
Carbon black	0.062	0.113	1.82
Products obtained by colloidal methods	0.068	0.123	1.88
	0.050	0.091	1.80
	0.046	0.087	1.90
	0.044	0.080	1.80
	0.034	0.078	2.22

The particle sizes for carbon black and lamp black, as given in *International Tables*, Vol. 11, page 286, are: carbon black, 0.15 microns; lamp black, 0.30-40 microns. If these figures are accepted as being accurate (which is extremely doubtful), some of the colloidally prepared products, on the basis of the above theory, must have a particle size under 0.1μ, whereas those

obtained by mechanical means must be about 10 times as large. It is difficult to say whether $\frac{\Delta}{\delta}$ is actually a measure of fineness or not. But, it can be said that when Δ and δ of pigments diminish and fall below a certain value the cohesive or molecular forces begin to make themselves felt both in pastes and in rubber. It was found on the whole that the reinforcing power increases with the voluminosity of the powder.

In the case of carbons, the problem is further complicated by the fact that δ also varies due to the method of preparation. In some instances, such as ferric oxide, very voluminous products were prepared. Their true density remained constant and thus the apparent density was the measure of reinforcement. In general, where the carbons are concerned, other phenomena which may also be contributing factors where reinforcement is concerned must be taken into recognition.

For example, in the preparation of the carbons used for these experiments the following peculiarities were observed: Sometimes, simply by washing with chemicals, a pure carbon with practically no ash content was obtained or contained only about 0.01% of ash. Suddenly, without an obvious reason, specimens with ash content of as much as 30% were secured. The ash showed itself inseparable and the only method of ascertaining its presence was by inducing combustion of the carbon. The retention of the ash is apparently due to some intense field of force which must be saturated if there is a high content of inseparable ash.

Determination of this phenomenon raised another problem, viz., if a carbon can be activated there must exist methods of deactivating it. Such a method has been evolved and thus the ash easily removed. The carbon can then be reactivated and again have the field of force which, it is believed, is one of the factors in the problem of reinforcement.

Among the varieties of carbon prepared for the present experiments by different methods there were reinforcing carbons, semi-reinforcing carbons, and carbons which did not reinforce at all. To determine this, pastes were prepared of several concentrations and curves traced. The results of these numerous experiments are represented in the curves shown in Figure 4.

In some cases it was found possible to transform a non-reinforcing carbon into one with reinforcing properties. In others, it was not possible to accomplish this result. In any event, the conditions of this transformation are not yet clearly understood, and can not as yet be defined in any suitable and acceptable manner. The phenomenon, however, seems worthy of outline and of further investigation.

Experiments with Rubber

Rubber, like most organic substances, has small surface tension. In practice, the reinforcement of rubber is accomplished by the addition of powdered substances or pigments, and the properties of the rubber compound depend very largely on the characteristics of the substance added. It is known, for example, that some pigments communicate their color to rubber, while some do not. Some reinforce rubber, others do not at all. The same substance used as a pigment may show an entirely different behavior in rubber according to its physical properties, which often can be varied within wide limits.

The varieties of carbons shown in the previous table

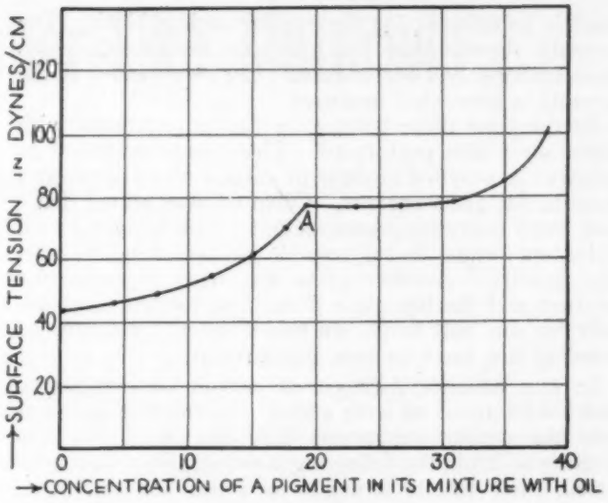

Figure 5.

were all tested in rubber. It was quickly determined that carbons ground mechanically were not properly assimilated and were condemned as unsuitable for use. Those obtained by colloidal chemical methods were found to contain some lumps formed during the process of evaporation and drying. These, however, acquired the necessary uniformity and fineness after treatment in the Forplex apparatus in which the lumps are projected with certain speed against a wall, are broken up, and the lightest particles carried away by a stream of air. After such treatment, dispersion of these carbons in rubber is satisfactorily accomplished.

The experiments were carried out in a commercial factory, on the basis of the following formula (parts by weight):

Smoked Sheet	100
Carbon Black	40
Tar	3
Stearic Acid	4
Zinc Oxide	5
Accelerator	1

Vulcanizates were prepared in the normal manner and test specimens in the form of rings were taken and tested for tensile strength in the usual way. The carbon black used was the standard type of black used in the rubber manufacturing industry.

One object of the tests was to determine which varieties of carbon might be used in place of carbon black, particularly in countries lacking carbon black facilities. The average figure for tensile strength of the mixture containing carbon black was approximately 3000 gr. per mm.^{2}. Experiments with carbons obtained by colloidal chemical methods replacing the carbon black in the formula shown resulted in tensiles not exceeding 1000 gr. per mm.^{2}, depending on elongation. At an elongation of 496% a tensile of 909 gr. per mm.^{2} was secured, at 520%, 1052 gr., at 486%, 808 gr., and at 446%, 775 gr.

However, when carbons with much lower values of the ratio $\frac{\Delta}{\delta}$ (ratio of apparent density to the true density) were prepared, as shown in the table, better results were secured. For samples giving the lowest value, i.e., 0.034, values reaching 2800 gr. per mm.^{2} were obtained. Such carbons may be considered as

possible substitutes for the regular carbon black. The formula shown does not give the best results with these carbons, and better results can be expected if the formula is somewhat modified.

At the time these tests were run experiments with pastes were also performed. These were prepared as follows: A weighed amount of carbon was placed on a smooth, flat glass surface. Olive oil was added dropwise until everything was wetted. The weight of oil added was equal to its volume multiplied by its specific gravity. Another glass was used to cover the mixture and the top glass plate then rotated mechanically for one half hour. In this manner, conditions of grinding are more or less standardized.

In one instance 2.29 gr. of carbon were taken to which 4.18 gr. of oil were added. In this 6.47 gr. mixture the carbon represents 2.29 gr. or 35.4%. By diluting with oil, the following concentrations were prepared, their tensile strength in dynes per cm. being shown:

Concentration (percent)	*Tensile Strength (in dynes/cm.)*
35.4	700.0
30.5	457.0
25.0	216.0
21.0	120.0
15.0	48.0
10.0	35.4
00.0	30.0

In this instance the $\frac{\Delta}{\delta}$ of the carbon equalled 0.03. Another carbon, with $\frac{\Delta}{\delta} = 0.068$ under similar conditions gave the following results:

Concentration (percent)	*Tensile Strength (in dynes/cm.)*
35.0	450
30.1	346
19.6	101
10.0	35
00.0	30

With some carbons having $\frac{\Delta}{\delta} = 0.3$, no rise in tensile strength is observed. Although the mass may be viscous the tensile strength remains substantially equal to that of pure oil, and prolonged grinding has no effect whatsoever.

Thus, there is a definite parallelism between the reinforcement of carbons in rubber, their reinforcement in oils, and also the value of $\frac{\Delta}{\delta}$. The same procedure is used to observe the critical phenomenon indicated in Figure 5. When titanium white was used in these experiments, the turning point in the curve corresponded to 19%. This figure may not be the same with all samples of titanium white, however. The apparent density of product, the time of grinding, and other factors, may displace all figures. However, the phenomenon is perfectly reproducible and always results in curves of the same type.

As indicated, the results of these tests showed that there is a close relationship between the reinforcing power of pigments in rubber and their behavior in pastes. In studying the effect of concentrations, curves of a fairly regular character were generally obtained. The breaking stress increased with concentration in a more or less regular way, so that the average of several experiments fell on a smooth curve. But when a certain concentration was reached this was no longer the case. And this factor was found to be in the region of concentrations where the mixture ceases to be soluble in benzene. Thus, there is evidence that the critical phenomenon indicated by Figure 5 has its analogon in the process of incorporation of pigments in rubber.

From the author's experience, it appears that the carbon black incorporated in rubber cannot easily be separated from it. In the few instances where such separation is attained, the carbon black is obtained in modified form, i.e., it loses almost all of its reinforcing properties.

The experiments described were performed in a special laboratory conducted by the author over a period of eight years. The laboratory was devoted to the production of various pigments on a pilot plant scale and to the study of the behavior of these pigments in various media, including rubber.

The work described was interrupted by force of circumstances and its continuation is not possible at present, and for this reason the author decided to publish the results obtained to date. It should be pointed out that some of the material in this article was presented by the author in the form of a paper before the American Physical Society at Evanston, Ill., on November 12, 1943.

Summary

This article describes the results of experiments dealing with pigments and their behavior in various vehicles. It was found that a close analogy exists between the behavior of pigments in some oils and in rubber. This analogy was followed up particularly from the point of view of surface tension. To this end methods of measuring the surface tension of solids previously developed by the author are described. In some systems the addition of the pigment produces an enormous increase of surface tension. In such cases the pigment and vehicle are almost inseparable. Some other pigments have no effect on the surface tension of the vehicle at all. In such cases pigment and vehicle remain separable. Pigments of the first category produce reinforcement in rubber, which increases with the reduction in particle size. Thus, by mixing pigments with some oils it can be determined how they will behave in rubber. The simple procedure described can, therefore, serve as a quick and economical means of control in the compounding of rubber. Properties of mixtures as a function of concentration have also been investigated by the surface tension method.

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The Elasticity of Rubber-Like Materials

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THIS paper is an attempt to give a brief survey of the range of properties exhibited by rubber-like materials and of the general theoretical ideas by which the physicist endeavors to understand and interpret them.

Fundamental Conceptions

From the molecular standpoint, rubbers show a rather striking similarity in their general structural pattern. They are all built up of chain-like molecules of relatively enormous length. The backbone of the chain is invariably in the form of atoms, or small groups of atoms, linked together by single bonds. We find also, that in order to produce a rubber with really good elastic properties, some form of vulcanization is essential. Within this general scheme, a wide choice is possible in specific chemical composition, particularly with regard to subsidiary groups not forming part of the backbone of the chain.

It is only in comparatively recent times that these general structural features of rubber-like materials have become clear, through the development of improved methods of studying the size and shape of large molecules, and our increasing knowledge of synthetic and natural high-molecular materials.

Early attempts to explain rubber elasticity went wrong mainly because they looked for some special feature in the chemical constitution of natural rubber to account for its remarkable properties. These attempts were uniformly unsatisfactory.

The correct solution to the problem was adumbrated by Meyer, von Susich and Valko *(1)* in 1932, and independently by Karrer *(2)* in 1933, and developed rapidly in the hands of Guth and Mark *(3)* and Kuhn *(4)*. These authors brought a fresh outlook to bear upon the problem. They postulated a *kinetic* conception of the origin of the elasticity, in which the thermal vibrations of the atomic units of the long-chain molecule play the leading role.

Since for the quantitative development of the theory the exact structure of the chain is of little significance, we may conveniently deal with the simplest possible chemical type, namely the paraffin chain. Such a chain will be capable of taking on a large number of configurations under the influence of the random thermal rotations of each C—C bond. The statistical treatment of the problem shows that the number of configurations available to the chain is a function of the distance separating its ends. The probability of a given distance r between the ends is proportional to the number of configurations corresponding to that distance, and is represented by the Gaussian error function

$$p(r) = A\, r^2 e^{-\beta^2 r^2} \qquad (1)$$

where A is a proportionality constant, and β is a constant determined by the chain geometry. The shape of this function is shown in Fig. 1. The normal state of the free molecule may be identified with the maximum of this curve, i.e., the most probable state, and the corresponding length r is found to be very much less than the full chain length.

It follows that if a molecule is extended by an external force acting on its ends and then released, the random thermal motions will rapidly restore it to a length not very different from its statistically most probable length. The molecule is therefore inherently elastic, and the amount of reversible extension is found to be proportional to the square root of the number of chain links. The characteristic form of a statistically-kinked chain, corresponding to a 1000-carbon atom paraffin molecule, is shown in Fig. 2.

The kinetic theory thus accounts in a natural and essentially simple manner for the observed fact that long-range extensibility is found only in association with chain-like molecules of great length. Moreover, the application of thermodynamic reasoning leads to certain rather striking conclusions which may be tested experimentally. Two of the more important of these are:

(a) In rubber held at constant extension, the tension is proportional to the absolute temperature.

(b) The extension of rubber takes place without change in its internal energy; hence, there is an evolution of heat equal to the work done on the rubber by the stretching force.

The first of these effects was tested experimentally by Meyer and Ferri *(5)* in 1935, who showed that for a vulcanized rubber containing 8 per cent of sulfur

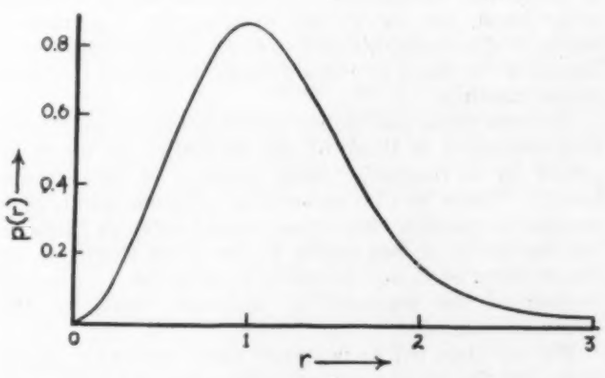


FIG. 1—Form of the function representing the probability of a distance r between the ends of a molecule (Equation 1).

Note: This article was presented as a paper before the Division of Rubber Chemistry, Chemical Institute of Canada, at Toronto, Ontario, Canada, on June 25, 1946, and is being published concurrently with *Canadian Chemistry and Process Industries.*

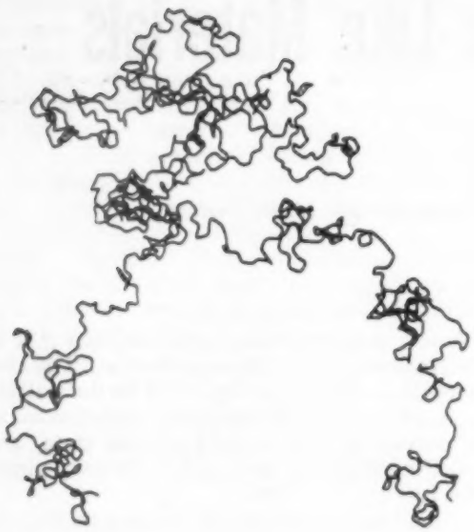


FIG. 2—Model of randomly-kinked paraffin chain of 1,000 links, based on the statistical theory.

the theoretical relationship was accurately obeyed over a range of more than 100°C., within certain limits of extension (Fig. 3). The second effect is well known, but a quantitative agreement between the work of extension and the heat evolved has not been obtained, chiefly because of the complicating effects of crystallization (with which is associated a latent heat). However, these two effects are so entirely different from what is found in ordinary solids under similar conditions, that the degree of agreement between theory and experiment may be considered highly satisfactory.

Conditions for Elasticity

Thus far our attention has been focused on the individual molecule. We have yet to consider in more detail how the elastic properties of the molecule are to be conveyed to the material in bulk. When we consider this problem we see that in order to be able to take up a variety of statistical forms in the way required by the theory, the molecular chains must have a freedom of movement comparable with that in a liquid. On the other hand, for the rubber to maintain a permanent shape, and to resist applied stresses, the molecules must somehow be fixed in their average positions relatively to one another.

To meet these two rather contradictory requirements it is necessary to think of the molecules as linked together by a relatively small number of unbreakable bonds. These will be present in sufficient numbers to produce a complete three-dimensional network throughout the material, but owing to the great length of the chains they need not seriously impede the freedom of motion of the segments of molecules between such points of junction.

We are thus led to postulate three necessary conditions for the occurrence of rubber-like elasticity, viz.,

(1) The presence of long-chain molecules, with freely-rotating links.

(2) Weak secondary forces around these molecules.

(3) A few points of cross-linkage, resulting in a loose three-dimensional network.

The ideal rubber may thus be thought of as a permanent network of long-chain molecules held toegther by unbreakable bonds, but otherwise completely free to move.

Before considering the properties of this idealized network in more detail, let us see to what extent real materials conform with the three conditions for elasticity postulated above, and the way in which their imperfect fulfillment may be expected to react on physical properties.

Firstly, it is clear that the rubber-like state is necessarily limited to a certain range of temperature. For at sufficiently low temperatures the effect of secondary forces between chains will predominate over the thermal energy of the chain atoms, and the rubber will transform to the glass-hard condition. In natural rubber these secondary forces are relatively weak, and the transition temperature is low (—70°C.), but the presence of strongly attracting side groups in materials such as polystyrene and polymethyl methacrylate may result in a transition temperature well above room temperature. These materials exist normally in the glassy state, and become rubber-like only at elevated temperatures.

Again, the effectiveness of the secondary forces may be related to the symmetry and regularity of the chain, these factors tending to promote easy "packing" and ultimately crystallization. An extreme example is polyethylene, which crystallizes almost immediately on cooling from a high temperature.

Crystalline rubbers are never 100% crystalline; they always contain a mixture of crystalline and amorphous components. Since the crystals are smaller in dimensions than the length of the molecules, a single molecule will normally traverse a succession of crystalline and amorphous regions alternately. Crystalline rubbers are relatively hard, but not glass-hard; the intimate molecular binding of crystalline and amorphous components leads to a peculiar combination of flexibility and toughness.

Molecules constructed on an irregular pattern, and in particular, synthetic interpolymers like the butadiene-styrene rubber, do not crystallize, either by cooling or by stretching.

The effect of the secondary forces between chains may be reduced by the incorporation of a swelling agent or plasticizer, which, by separating the molecules, ren-

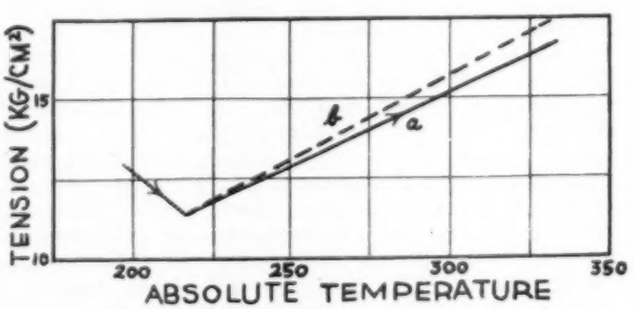


FIG. 3—Variation of tension at constant length with absolute temperature for vulcanized rubber (Meyer and Ferri). (a) 350% extension, experimental curve; (b) 350% extension, corrected for thermal expansion. (Reproduced from "Helvetica Chimica Acta," Vol. 18, p. 570.)

ders the transition to the glassy or crystalline state less easy, and thus extends the temperature range over which rubber-like properties may be found.

Turning now to the question of cross-linking, it is known that vulcanization converts natural rubber from a soluble condition to a state in which it is still capable of swelling, but will not dissolve. Unvulcanized rubbers may show varying degrees of elastic recovery due to the fact that certain cohesive forces between chains are always present, and for stresses of short duration such cohesive forces may be sufficient to maintain certain contacts between the long and mutually entangled chains unbroken.

The important consideration is that completely reversible elasticity necessarily requires that a certain number of effective junction points (e.g., about 1 per chain) should remain unbroken under the stress, and for stresses of long duration this normally means that such junction points must have a strength comparable with that of the molecular chains themselves, i.e., they must be primary chemical bonds.

In fact, we may think of the ideal rubber as a system of long chains, permanently connected at certain points so as to form a three-dimensional network, but endowed with complete freedom of motion with regard to the rotation of the individual links of the chain. Thus defined, the ideal rubber represents a special state of matter having characteristic properties quite distinct from those of the solid, liquid and gaseous states, but equally well defined and capable of an exact theoretical analysis.

Theory of the Molecular Network

The properties of such an ideal network of long-chain molecules have been the subject of detailed examination on the basis of statistical theory by a number of authors. James and Guth *(6)* in 1941 derived the following formula for the stress-strain curve of rubber in elongation and unidirectional compression:

$$F = KT\ (\alpha - 1/\alpha^2) \qquad (2)$$

where F is the tensile (or compressive) force referred to the unstrained cross-sectional area, and α is the extension (or compression) ratio, K being a constant determined by the detailed structure of the network. In the following year Wall *(7)*, from a somewhat different approach, arrived at the same equation, and gave also the solution for the case of a simple shear, namely

$$F_\sigma = KT\sigma \qquad (3)$$

$F\sigma$ being the shear stress, and σ the magnitude of the shear strain. More recently the author *(8)* has extended Wall's method to the case of the most general type of homogeneous strain, characterized by three different stretches λ_1, λ_2 and λ_3 parallel to the three coordinate axes. The resultant work of deformation W was shown to be of the form

$$W = \tfrac{1}{2}\ KT\ (\lambda_1^2 + \lambda_2^2 + \lambda_3^2 - 3) \qquad (4)$$

Knowing the work of deformation, it is possible to determine the stress system required to maintain the given deformation.

These conclusions are of unusual interest in that they provide a sound basis for the development of a comprehensive theory of large elastic deformations for rubber-like materials comparable with the existing classical theory of elasticity for small deformations. We notice, in particular, that whereas the stress is proportional to the strain in the case of simple shear (equation 3), this is not in general true for other types of deformation,

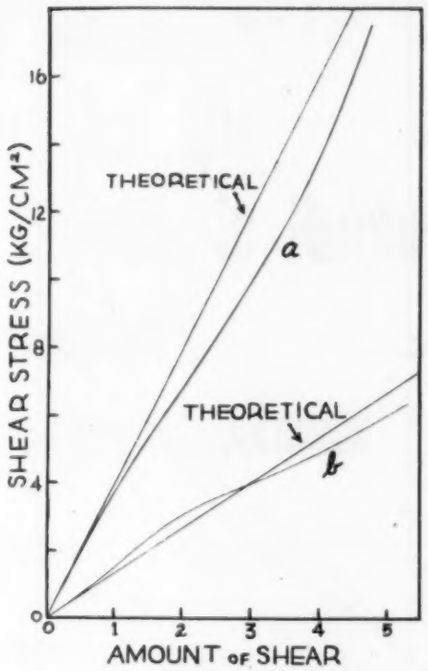


FIG. 4—Shear stress-strain relationships for vulcanized rubber. (a) Pure shear; (b) Shear superposed on elongation of 200%. (Note: Figs. 4, 5 and 6 are reproduced from "Transactions of the Faraday Society," Vol. 50, p. 59).

e.g., elongation (equation 2). Moreover, the stresses in any type of deformation of a rubber can be calculated if a single physical constant (KT) is known. If one makes the simplifying assumption that all the chains in the network have the same length, this constant may be related to the molecular weight (M) between points of cross linkage, thus

$$KT = \rho\ RT/M$$

where ρ is the density of the rubber, and R is the gas constant. The elastic stresses are thus inversely proportional to the chain length between junction points in the network.

Experimental Verification

In order to illustrate the degree to which these theoretical equations may be used to describe the properties of an actual rubber, some experimental data obtained by the author, using natural rubber vulcanized with 8% of sulfur, are included. The data for all the types of deformation examined were obtained from a single sheet of the rubber, and are thus quantitatively comparable.

Fig. 4 represents the behavior in pure shear. Curve (a) shows a linear relation between shear stress and shear strain up to a shear strain of about 1.0 (angle of shear = 45°); thereafter there is some departure from the theoretical linear law. The value of the constant KT in equation (3) for the linear region is 4.0. Fig. 4(b) represents the effect of a shear on a piece of rubber previously subjected to a simple elongation, the plane of the shear being at right angles to the elongation. (The resultant strain may be visualized by con-

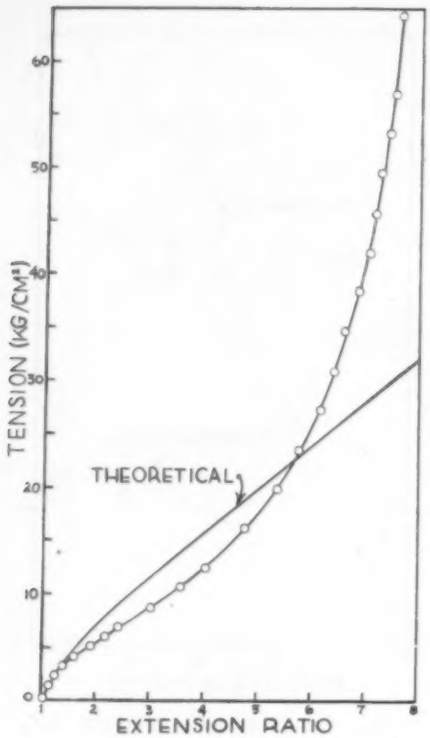


FIG. 5—Theoretical and experimental stress-strain curves for simple elongation.

sidering a circular cylinder deformed in two stages, first by an extension in the direction of its axis, and secondly by a shear at right angles to this direction, in which the cross-section is deformed from a circle to an ellipse). The theoretical analysis of this problem, on the basis of equation (4), shows that under these conditions the relation between shear stress and shear strain should still be linear, but with the constant of proportionality in inverse ratio to the initial extension ratio.

In Fig. 5 the experimental curve for a simple elongation is compared with the theoretical formula (2), with

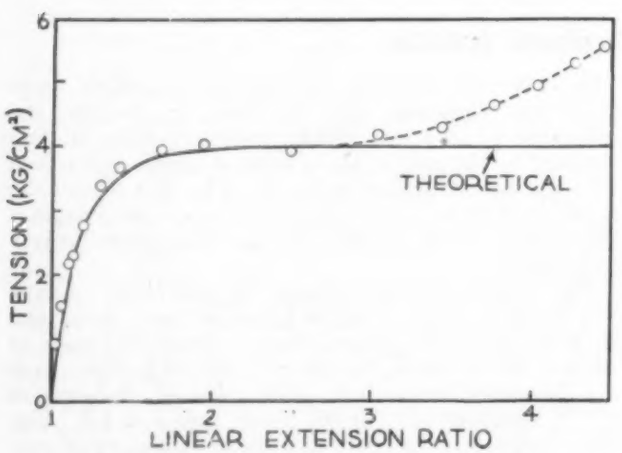


FIG. 6—Theoretical and experimental stress-strain curves for 2-dimensional extension.

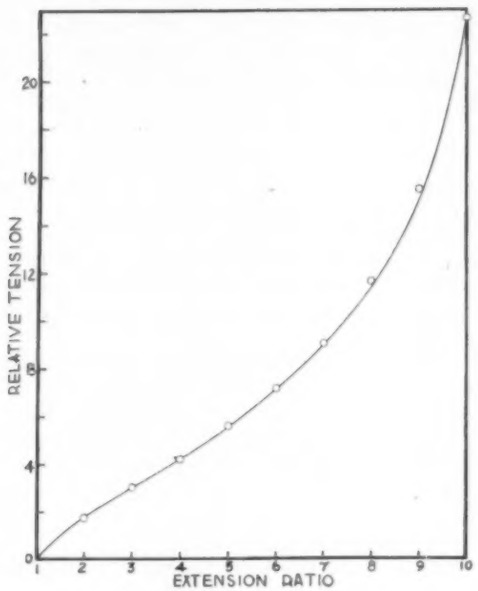


FIG. 7—Complete stress-strain curve for elongation derived from statistical theory. Solid line, author's theory; circles, theory of James and Guth.

KT again equal to 4.0. The agreement with the theoretical form is rather less close than in the case of pure shear.

Fig. 6 refers to a 2-dimensional extension, of the type encountered in the inflation of a balloon. The tension (t) in kilograms per cm. of the strained sheet, referred to a sheet of unstrained thickness 1 cm., is theoretically related to the linear extension ratio λ by the formula

$$t = KT\ (1 - 1/\lambda^6) \qquad (5)$$

The experimental data fit this formula very closely, up to $\lambda = 3$, using $KT = 4.0$.

In considering the significance of the equations derived from the theory of the molecular network for the interpretation of the stress-strain relations of vulcanized rubber, it must be borne in mind that the theory is based on a highly-simplified model, and hence could not be expected to account accurately for the properties of any real material. Furthermore, no adjustable parameters are introduced to facilitate the fitting of any given type of curve.

The important result which appears is that, by a suitable choice of the one disposable constant incorporated in the theoretical equations, *all* the types of strain examined may be described in an approximately quantitative manner, and practical effects (like that of the combination of elongation and shear) may be correctly predicted. The theory is, moreover, sufficiently simple in mathematical form to provide a valuable basis for the development of a general treatment of more complex types of deformation including inhomogeneous strains.

One important departure from the theoretical stress-strain curves may be referred to, namely, the upward curvature which sets in at large strains (cf. Figs. 5 and 6). This corresponds to the approach to the full

(Continued on page 236)

Developments in the Field of Testing Procedures for the Evaluation of Natural and Synthetic Rubbers and Plastic Elastomers

Sponsored by Bureau of Ships, Navy Department

Part VII—Conclusion

By THEODORE A. WERKENTHIN

Principal Materials Engineer, Bureau of Ships, Navy Department, Washington, D. C.

SWELLING AND IMMERSION TESTS (Cont'd)

Test to Determine Resistance to Concomitant Sea Water and Gasoline Immersion: Control valve mechanisms used in fuel oil and gasoline tanks, in which sea water and fuel are used, required the use of an impervious flexible cable in which the control cable for opening and shutting the valves was located. The coating for these flexible cables had to be resistant to the usual petroleum and aromatic solvents, and to sea water, and had to resist steaming out temperatures. When repairs were effected in these tanks, the coating had to be such that it would not absorb quantities of the fuel which would then be released and might result in producing an atmosphere which would be explosive. In order to evaluate various proposed coatings, the Rubber Laboratory, Mare Island, was requested to develop a test procedure capable of determining these properties. The apparatus used is shown in Figs. 87 and 88.

The flexible tube with the experimental coating applied was inserted in the stuffing gland, top and bottom, so that it was air and watertight. The surrounding chamber was then filled with sea water and the fuel against which it was desired to test. The respective levels of the sea water and the fuel were changed from day to day to simulate actual service practice. In other words, as the fuel was withdrawn, additional quantities of sea water would be added until the tank was nearly empty of fuel. Then the tank would be refilled completely with fuel and the process of withdrawing fuel and replacing with sea water repeated.

As indicated in the sketch, a desiccant tube was inserted in the inside of the flexible tube in order to determine if any of the moisture or water vapor had penetrated through the flexible lining. By weighing the tube before and after, the integrity of the lining could be determined. After several complete cycles, the fuel and gasoline were removed from the container and live steam at atmospheric pressure was passed through the chamber. After the steaming-out process, the alternate filling and emptying of the container was repeated

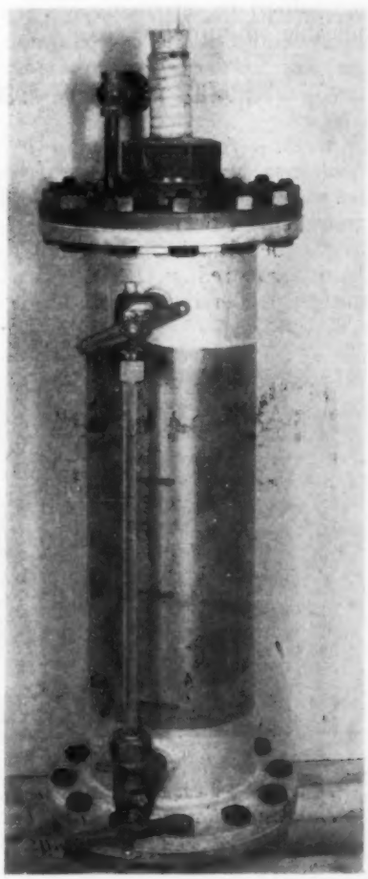


FIG. 87—Apparatus for concomitant and intermittent immersion in sea water and gasoline.

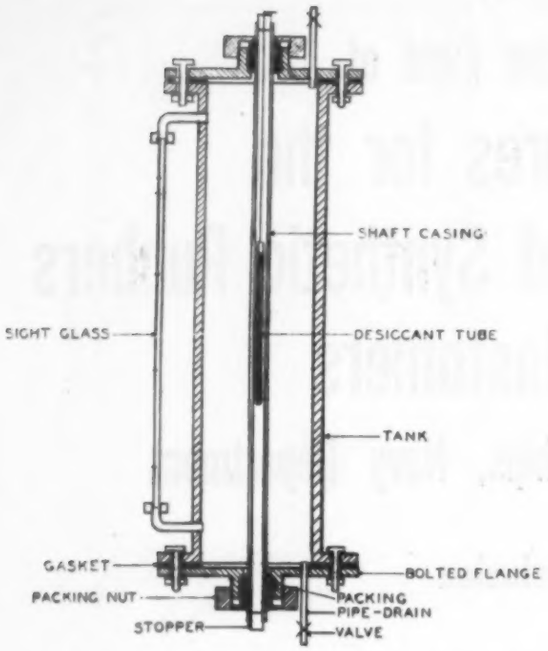


FIG. 88—Testing tank for immersion test showing details of assembly.

to determine if the steaming-out had injured the coating.

While this is a specialized test, and may not be of general application, it is indicative of the type of tests which have to be developed by the Navy laboratories in order to properly evaluate materials to meet the specialized requirements which in many cases are applicable only to Navy use.

VIBRATION AND SHOCK ABSORPTION TESTS

Method for Determining Vibration Absorption of Matting: Naval personnel frequently have to stand on a platform which is subjected to violent and high frequency vibration, which is exceedingly fatiguing to the personnel, for example, when standing watch. In order to reduce the intensity of the vibration transmitted to personnel, vibration absorption mats were developed. In order to evaluate the relative efficiency of the several types of mats that were developed, a simple test procedure was utilized. This apparatus was developed by the Rubber Laboratory, Navy Yard, Mare Island. The apparatus consisted of an off-balance flywheel on the shaft of a high speed air motor. The air motor is mounted in the center of a steel platform ¼" thick, 2 feet wide and 8 feet in length. The sample to be tested consists of a 12" square mat which is placed at another section of the steel platform. On the bottom side of the platform immediately under the mat section, a vibrometer pickup is firmly attached. A 50 lb. cylindrical weight is placed on the mat and another vibrometer pickup is attached to the top of the steel weight. The vibration frequency can be varied by changing the revolutions of the air motor. The speed of the flywheel is measured with a strobotac. The amplitude of vibration of the platform is varied by adjusting the weights of the off-balance flywheel to cover any convenient range. This apparatus was found satisfactory in evaluating the benefits which might be obtained from various types of vibration absorption matting for personnel standing watch in engine rooms.

Compression Deflection Test for Submarine Battery Lining: The rubber lining of the submarine battery compartment is thought to contribute not only a cushioning effect to batteries placed therein, but it is also thought to have a shock absorbing property. In the evaluation of rubber lining for submarine battery compartments, it is, therefore, necessary to evaluate compression deflection as well as the ability of various linings to resist shock. A steady deflection load test has already been described under Rheological Properties and forms a test procedure specified in Navy Department Specification 33L4 for linings of submarine battery compartments. In addition, it was desired to have a test in which compression deflection could be measured when this load was applied suddenly instead of gradually. An apparatus of this type

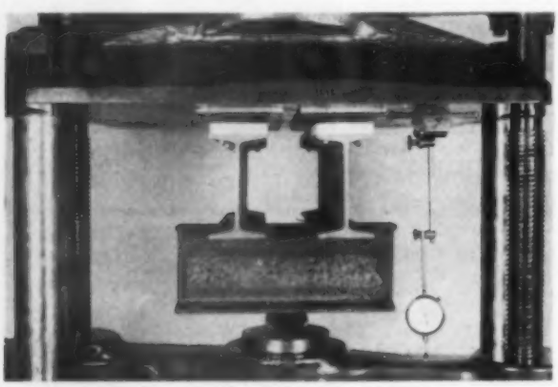


FIG. 89—Test apparatus in position for compression-deflection test of battery compartment linings.

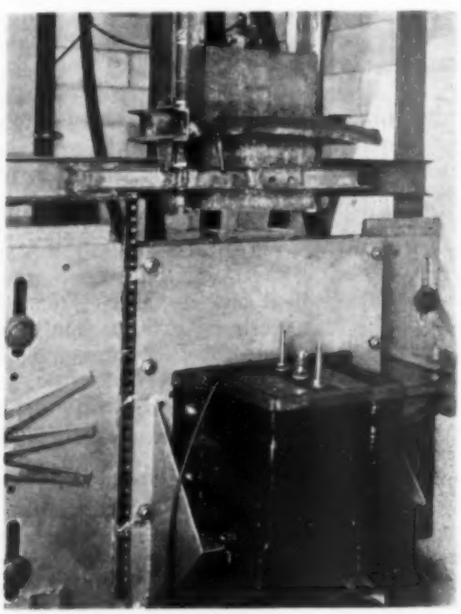


FIG. 90—Test apparatus in position for shock test.

is illustrated in Fig. 89. Any desired total loading can be applied as rapidly as desired in order to determine the deflection which results therefrom.

Shock Test of Submarine Battery Lining: As stated above, the protection against shock, particularly the type of shock received from underwater explosions resulting from depth charges, is a property which is necessary to evaluate. For this purpose the Material Laboratory, Navy Yard, New York, developed a test which will evaluate the relative resistance that different materials offer to such shock. The setup is shown in Fig. 90. A steel box is lined with the rubber covering to be evaluated and a lead weight is inserted in the box. This box is attached securely to the anvil plate of a shock testing machine and is then subjected to impact by a pendulum hammer dropped from a calculated distance. Similar tests are then conducted by mounting a steel box which is not rubber lined holding a lead weight of similar size, and measuring the shock transmitted to the weight. The measurements are conducted with a mass-spring accelerometer which is centrally located and screwed into the upper face of the weight. Typical results with rubber linings showed a residual average acceleration of 36 g, whereas an acceleration from 175 g to 200 g is obtained without the rubber lining under the same conditions of test. It should be pointed out that in these shock tests the pendulum hammer does not strike the test piece itself, but transmits the impact through the heavy anvil on the reverse side from the one shown in the illustration.

TEAR AND CUTTING TESTS

Wire Cutting Test for Rubber Gloves and Similar Materials: For many years the rubber industry has been trying to find satisfactory cutting tests and tear tests, and a large number of procedures have been proposed. The difficulty with most of these tests has been that they do not simulate service conditions too closely and frequently do not correlate with service experience. The Rubber Laboratory, Navy Yard, Mare Island, has developed a procedure which utilizes a standard dumbbell test specimen and a piano wire as a cutting medium. An illustration of the equipment is shown in Fig. 91. The apparatus is mounted in a Scott rubber tester as shown in the illustration. The specimen being a No. C A.S.T.M. dumbbell approximately 0.08 inch in thickness and doubled over and held in the jaws of a pincer clamp. The section of music wire 0.014 inch in diameter is clamped in a "U"-shape mechanism illustrated in the figure. The machine is run at a speed of 20 inches per minute. The force necessary to cut the dumbbell specimen by means of the wire is recorded as the cutting resistance of the rubber.

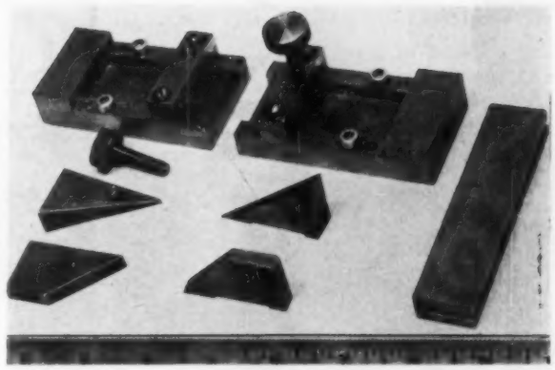


FIG. 92—Parts of tapered block tear tester grips and nicking jig.

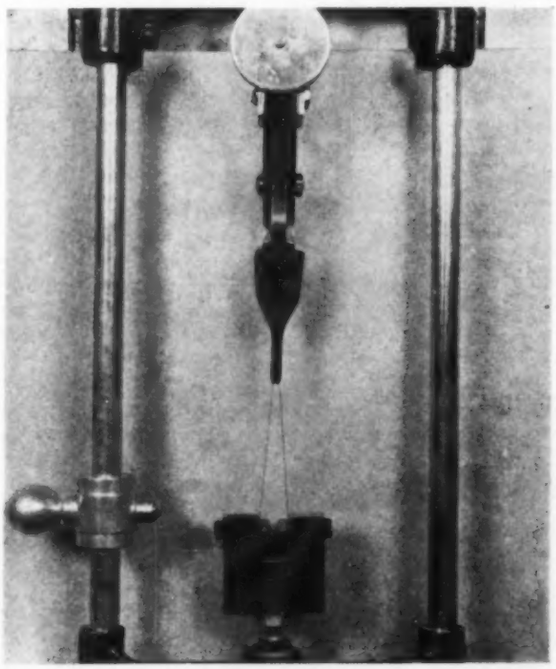


FIG. 91—Apparatus for wire cutting test mounted on a Scott tester.

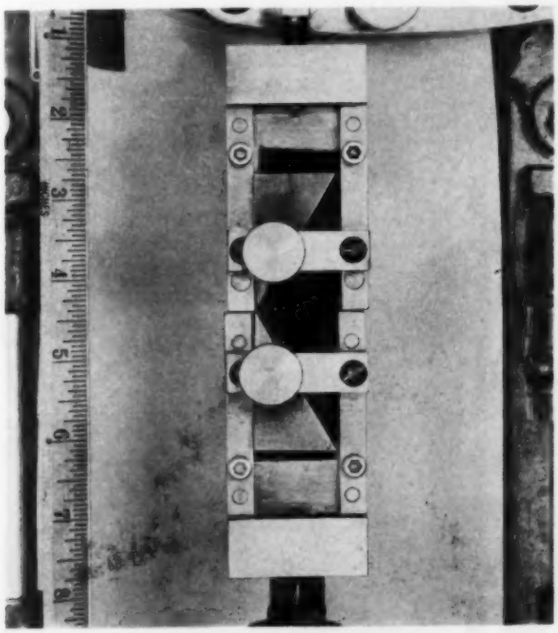


FIG. 93—Tear tester with strip specimen in position for test.

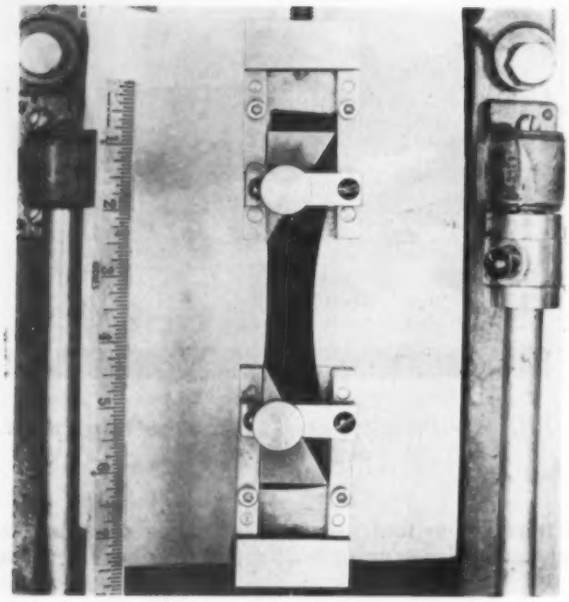


FIG. 94—Un-nicked specimen under test to show stressed condition.

Concentrated Load Tear Test: This test was recently developed by the Material Laboratory, Naval Shipyard, New York. It simulates service conditions by subjecting a strip of rubber to high stresses on one side and to low stresses on the other side by means of a specially designed clamp. The unassembled unit is shown in Fig. 92; the tear tester with strip specimen in position in Fig. 93. The un-nicked specimen is shown stressed in Fig. 94, while the nicked strip specimen under test lengthwise of the grain of rubber is shown in Fig. 95. Note that the rubber on the right is under much less tension than that of the left side. The nature of tear is shown in Fig. 96. The specimen is wide enough to clearly show the effect of tear whether against or with the grain. This type of tear test is particularly useful for testing such important items as electrical and acid gloves. The specimen used is 1 inch wide, by 4 inches long, and has a thickness of 0.10 inch. Load required to induce tearing and load required to sustain tearing is recorded. The average of five specimens is generally taken, although in instances where the sample is limited, three specimens will suffice. The test is suitable for determining changes in tear loads due to immersion in solvents or changes resulting from bomb aging, light and ozone aging.

Tear and Cutting as Result of Impact: A specialized test was recently developed by A. W. Cizek, Jr., and H. Nestlen of the Material Laboratory, Naval Shipyard, New York. The apparatus shown in Fig. 97 was set up to determine tear and cutting of rubber when subjected to repeated impacts of ⅞ inch diameter wire rope. It is not only important to note the condition of the rubber subjected to this impact but also the condition of the wire rope after 10,000 impacts of thirty foot-pounds.

The apparatus consists of a compound pendulum to which was attached a 14 inch length of ⅞ inch diameter wire rope, so that at the lowermost point in the stroke of the pendulum the rubber test specimen was subjected to a 30 foot-pound impact. Development of this test is another illustration of the need for specialized methods of evaluation which must sometimes be resorted to supplement the conventional physical and chemical methods.

Cover and Carcass Break Test for High Pressure Steam Hose: S. A. Eller and C. K. Chatten of the Material Laboratory, New York Naval Shipyard, have recently developed test equipment and procedure to determine resistance to break of cover and carcass of

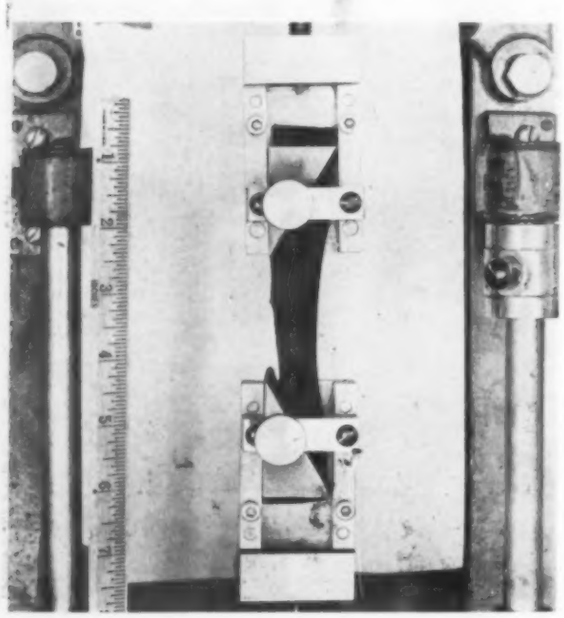


FIG. 95—Nicked strip specimen under test lengthwise of grain of rubber.

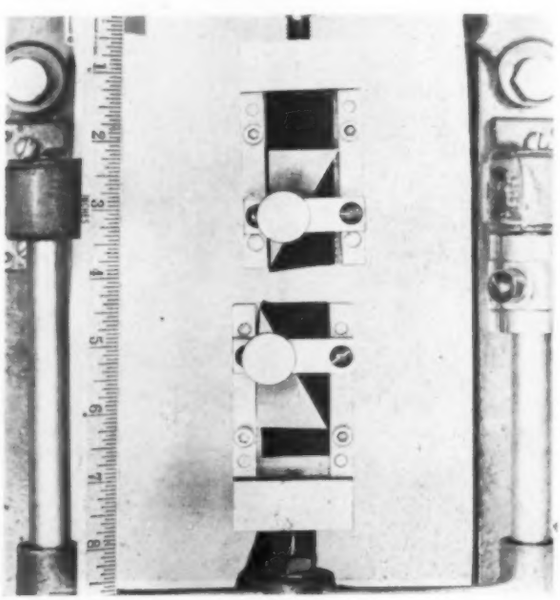


FIG. 96—Nature of tear.

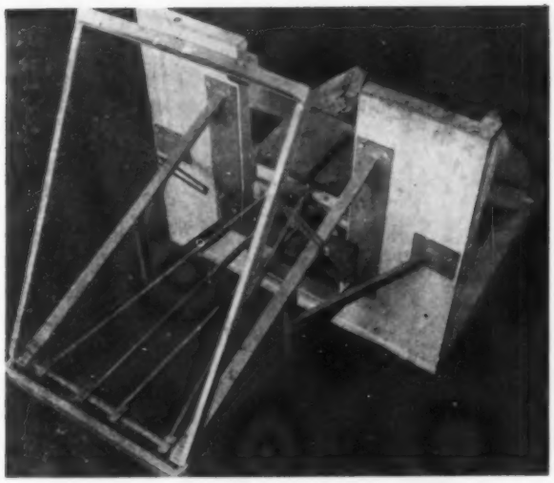


FIG. 97—Apparatus for determination of resistance to impact.

high pressure steam hose. This test closely simulates actual service conditions but at the same time accelerates evaluation since the machine can be set to undergo 845 complete cycles per hour. A work day of the usual 7 hours resulted in 5915 cycles or 20,280 for continuous 24 hour operation.

The test equipment is shown in Figs. 98 and 99. It consists essentially of an oscillating arm for flexing a length of hose through an angle of 45 degrees on either side of the normal perpendicular position, and a set of rollers over which the hose is turned. The arm is driven by means of a rack and gear device so arranged that the angle of rotation of the arm can be varied by varying the amount of horizontal travel of the rack. The rack is operated by means of an adjustable crank keyed to the output shaft of a speed reducer which is driven by an electric motor. The apparatus is equipped with a set of retaining rollers positioned directly below the flexing rollers.

A 50 in. length of steam hose is fitted with a pipe connection and valve on one end, and a coupling on the other end. The end of the hose having the valve is then clamped to the upper end of the oscillating arm of the flexing apparatus, and the hose is passed between the flexing and retaining rollers. A 25 lb. weight is suspended from the lower portion of the hose and the hose coupling is attached to a source of steam regulated to 150 pounds per square inch. The hose is then flexed at the rate of 845 complete flexes per hour for a period of 7 hours on each of two consecutive days. The hose is flexed while under 150 pounds per square inch steam pressure but is allowed to rest under no steam pressure between the two 7 hour tests. Fig. 98 shows the equipment and hose assembly in neutral position. The position of maximum bend is shown in Fig. 99.

After making the cover and carcass break test described above, tensile and adhesive strength tests are made on specimens of hose taken from between the flexing rollers of the test equipment and the hose clamp. The same tests are made on specimens of the hose taken near the coupling, that is, on a section of the hose which has been cycled under 150 lbs. per square inch steam pressure but is not subjected to flexing. These results are compared with tensile strength and adhesion values on a section of hose before being subjected to the break test.

SURFACE INTEGRITY TESTS

Surface Integrity Determined by High Frequency Spark Tester: In the evaluation of large rubber surfaces, particularly in the evaluation of rubber shaft

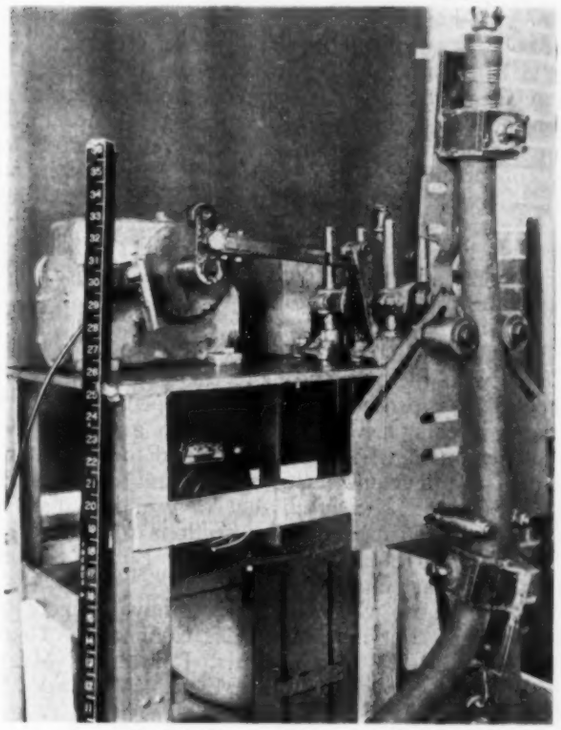


FIG. 98—Cover and carcass break test for high pressure steam hose, showing equipment in neutral position.

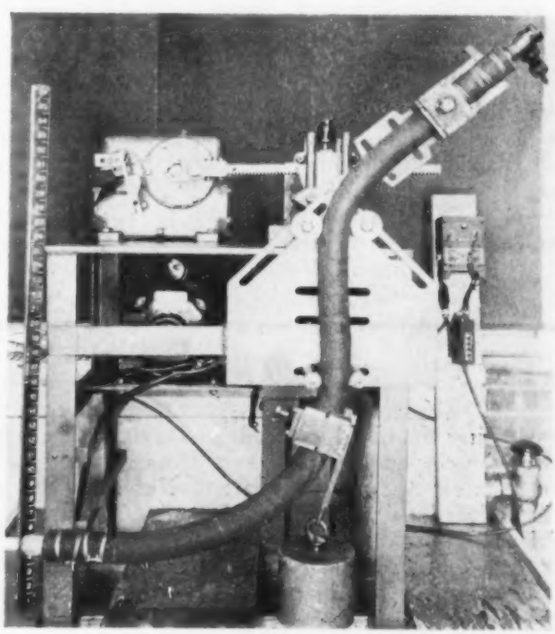


FIG. 99—Cover and carcass break test for high pressure steam hose, with hose assembly in position of maximum bend.

covering, a modified procedure using corona discharge has been developed by the Material Laboratory, Navy Yard, New York, which has been found to be reliable and quick. The apparatus used in the test is the standard high frequency, high voltage tester manufactured by the Chicago Electric Scientific Company, Chicago, Illinois, illustrated in Fig. 100, except that the pointed electrode is substituted by a brass electrode, 8" long by ¼" in diameter, bent to conform to an arc of a circle whose diameter is equal to the diameter of the rubber-covered shaft. In conducting this test, it has been found advisable to pass the curved electrode over the rubber shaft covering at a slow rate, but in such a manner that the corona discharge was not continued in any one spot for any length of time. This was particularly necessary in testing certain synthetic rubbers which had a tendency to burn through more readily than natural rubber coatings.

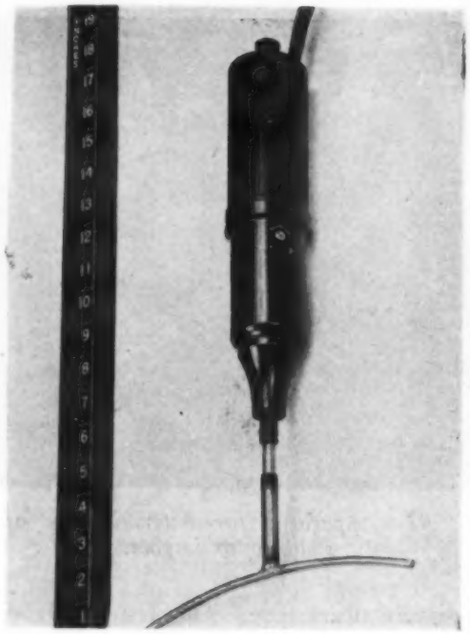


FIG. 100—High frequency spark tester used in surface integrity test.

ACKNOWLEDGMENTS

In view of the broad scope of this paper and the fact that these test procedures were developed over a period of many years, it will be difficult to give full credit to all personnel who have contributed to the enhancement of the development of rubber and synthetic rubber evaluation. Nearly all the Navy and civilian employees in the rubber testing sections of the various Navy laboratories involved and of the Bureau of Ships have had a part in the program.

A list of those who are known to have actively participated and contributed includes Commander George Barsky, Lt. R. P. Devoluy, Mr. John Lind, Mr. H. Nestlen, Mr. C. K. Chatten, Mr. A. W. Cizek, Mr. D. H. Kallas, Mr. S. A. Eller, and Mr. N. K. Graves of the Material Laboratory, Navy Yard, New York; Lt. W. Woodnut, Mr. R. E. Morris, Mr. R. R. James, Mr. A. E. Barrett, Mr. J. W. Hollister, Mr. E. B. Caldwell, Mr. J. C. Montermoso, Mr. E. H. Berger, Mr. Wah Bong Lew, and Mr. I. P. Seegman of the Rubber Laboratory, Navy Yard, Mare Island; Mr. R. Hess of the Industrial Laboratory, Navy Yard, Mare Island; Lt. W. Shatterly, Dr. Dan Fore, Dr. A. D. Swenson, Dr. Peter King, Mr. R. C. Taylor, Mr. A. R. Jones, Mr. L. B. Lockhard, and Mr. M. A. Elliot of the Naval Research Laboratory; Mr. David Richardson and Mr. R. F. Thornley of the Industrial Laboratory, Navy Yard, Philadelphia; Mr. Philip Mitton and Mr. Thomas L. Sheehan of the Materials Testing Laboratory, Navy Yard, Portsmouth; Mr. N. C. Wiley, Mr. Frank McGeary, Mr. J. B. Lunsford, Mr. E. A. Bukzin, Mr. R. E. Harmon, Mr. Robert Webster, Mr. F. H. Gorman, Mr. S. E. McCrary, Mr. R. P. Metcalf, and Dr. Scott P. Ewing of the Bureau of Ships. Miss Ethel Levene of the Bureau of Ships Rubber Section also deserves special mention for her efforts in assembling and selecting test procedures and in proofreading, indexing, and some of the editorial work.

It is also desired to acknowledge the help and encouragement of the various Section Heads and Administrators; namely, Captain T. A. Solberg, Captain W. C. Latrobe, Captain W. S. Newton, Commander A. E. MacGee, Commander J. C. Radford, and Lt. Commander H. F. Galindo.

Acknowledgment must also be made of the wholehearted cooperation of the rubber manufacturers and the manufacturers of scientific equipment who have cooperated in many of these developments.

To the author, the outstanding feature of this compilation is the realization of the coordination and cooperation of the various far-flung technical activities of the Navy Department working together for the ultimate purpose of constantly improving the already high quality of all rubber materials used by the Navy.

Extreme sensitivity to variations in the percentage of CO_2 in the flue gas is said to be one of the outstanding features of a new **Davis-Hebler Recorder** developed by the Davis Emergency Equipment Co., Inc., 182 Halleck St., Newark 4, N. J. It is claimed this sensitivity causes an amazingly quick response and enables this instrument to record a change 3½ seconds after the variation in CO_2 content of the flue gas has reached the analyzing cell.

Carson Micrometer Corp., 28 Edison Pl., Newark 2, N. J., is producing four re-designed models of its **Electronic Micrometer** for precise thickness measurement in the shop or laboratory. Outstanding feature is the electronic circuit used in conjunction with the micrometer screwhead. Units are portable and weigh twenty pounds complete.

Development of a new type **instrument gauge** for the measurement of metal sheet stock and the inspection of the bonds between the laminar layers of laminated materials has been announced by the Glenn L. Martin Co., Baltimore 3, Md. Operating on the pressure principle, the gauge consists of an inverted cupshaped shell with a top wall of transparent material and the bottom rim edged with a rubber gasket.

Printing on Vinyl Film

By CHESTER M. ROBBINS

Vice-President,
Aridye Corporation,
Fair Lawn, N. J.

THE volume of vinyl films which has been introduced to the printing industry totals many millions of yards. By vinyl films we refer particularly to the vinyl chloride copolymers, and the copolymers of vinylidene chloride and vinyl chloride. These films range in thickness from 1 to 40 mil in the cast type, and from 4 to 45 mil in the calendered type. They are produced in widths ranging up to 60 inches, occasionally over that. One problem has been to find printing equipment of proper widths to handle it. Because of the types of ink necessary to print thereon, the pressure has been on the rotogravure printer. Rotogravure printing equipment in the packaging industry has been, with a few exceptions, pretty well confined to widths not exceeding 28 inches. The only other existing type of rotogravure print machine suitable for film is in the textile industry. Textile print machines available for this type of printing run from 33 to 60 inches.

Aridye Corporation is interested primarily in the manufacture of pigment dispersions for printing on textile print machines. In view of the fact that the bulk of the 4-mil calendered films is produced with an intended textile end use — that is, shower curtains, aprons, window curtains, etc.—it is only natural that we took the initiative in developing proper printing mediums. Although heavy-gauge film—that is, from 18 to 45 mil thickness—is going primarily into the luggage, pocketbook, and footwear industries, its decoration and treatment also required wide printing machines and it, too, has had to go to the textile print machine. This does not mean that the textile printer is doing all the printing of vinyl film today. He started out in it, but since then several printers without a textile printing background have started up with textile print machines.

In order of volume, there are three principal methods of printing vinyl film. They are:

1. Rotogravure. For this method there are two types of equipment: (a) The textile print machine, and (b) The unit type for film and paper.
2. Screen and air brush.
3. Transfer.

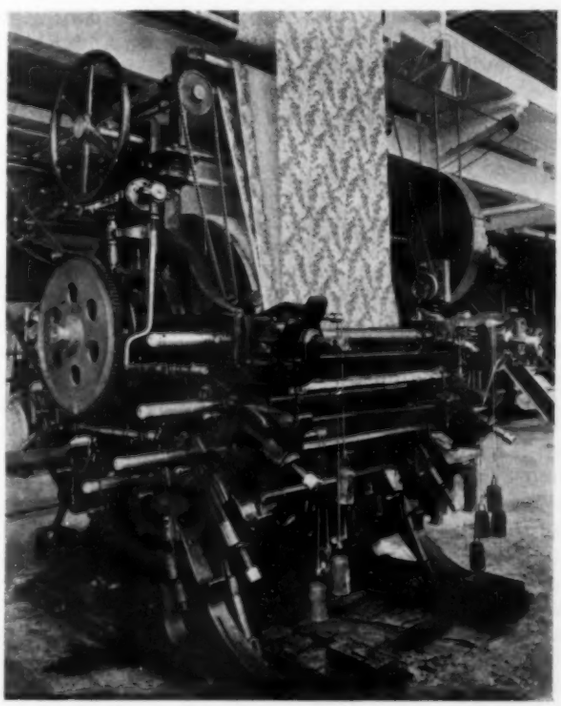
Rotogravure printing consists of depositing an ink, usually pigmented, on the film from recessed surfaces on a copper roll. It is also known as intaglio printing.

A textile printing machine consists essentially of a steel impression cylinder (usually synthetic rubber covered) approximately 18 to 30 inches in diameter, around which are grouped the printing units. The printing unit consists of a color box which of course contains the color, a furnisher roll which carries the color up to the engraved roll, the engraved roller, and a steel doctor blade—either fixed in position or oscillating—which wipes the excess color off the roller and returns it to the color box. A complete unit is necessary for each color printed. The impression cylinder is not driven, but the engraved roll is, thus the tension is theoretically constant once fit or register is obtained, as the film is always in contact with the impression cylinder. Actually, adjustments must be made constantly by moving the engraved roll up or down as films vary in dimension. Also the print machine itself is not the last word in synchronization.

Color Requirements

The formulation of the colors or inks, as they are better called, has been no small problem. It has been further complicated by the fact that with very few exceptions, film production has not been uniform. A proper ink must have the following qualities:

1. It must be fast to light.
2. It must be fast to alkali.
3. It must be fast drying to the point that on a multicolor print it will not carry over to the next color nor smudge, and yet not dry in the engraving.



Typical of machines suitable for printing on vinyl films is this standard eight-color printing machine made by the Rice Barton Corp., Worcester, Mass.

Note: This article is based on a paper delivered by the author at a meeting of the New England Chapter of the Society of the Plastics Industry, held in Manchester, Vermont, on October 18, 1946.

4. It must dry sufficiently fast so that there will be no tack to permit blocking.

5. The color must not bleed or sublime.

6. In heat-sealing operations there must be no transfer.

7. When the ink is thoroughly dry, there must be a perfect bond between it and the film. The print must become part of the film.

These properties are attained by the use of selected alkali-proof, light-fast pigments. Some are organic and some are inorganic, and they must be carefully chosen. This is also true of metallic powders that are used for obtaining gold and silver effects. These pigments are then dispersed in vinyl resin which has been dissolved in the ketone type of solvents. Formulae are varied according to the type of resin used, and solvents must be balanced to suit each particular condition. Thinners may be added to obtain proper viscosity, drying speed, and also to obtain better adhesion.

Owing to the smoothness of the film surface and the type of almost water-thin ink used, everything on the engraved roller is printed on the vinyl film—defects, as well as design. Engraved rollers are usually copper and may be chrome plated. There is some difference of opinion as to which is the better. The engraving may be either photographic, which is a chemical etch, or pantographic, which is a mechanical etch. The engraving should be shallow and the screen or ground must be fine—100 to 170 lines to the inch on pantographic, 85 to 185 on photographic. The rolls must be highly polished and free from any defects or dirt.

The passage of the film through the machine is accomplished by unwinding the film close to the impression cylinder. The film follows around the cylinder passing between the inked engraving and the cylinder, is printed, then taken off the cylinder on a synthetic rubber blanket, and dried.

Printing speeds vary from plant to plant, and from film to film. Single-color prints have been run in production as high as 75 yards per minute on a textile machine, and 125 yards per minute on a unit type machine. The average is probably nearer to 40 yards per minute. Multi-color prints, i.e., 2 and 3 color, will average about 30 yards per minute, and 4-color jobs nearer 25 yards per minute. Deterrents to high speeds are twofold. The first is the fact that the material is relatively expensive, and bad printing cannot be corrected as it often may be on textiles. Once a print is on the film it is there to stay. The second is that most vinyl film is in 250-yard rolls, thus requiring frequent machine stops. Larger rolls are possible, and printers are splicing film to get them. However, printers find that best production is obtained by making haste slowly. What actually happens in the printing operation is that when the ink strikes the film it carries enough solvent with it to partially dissolve the film at point of contact. Almost instant drying restores the surface of the film, leaving the deposit of pigment as part of the film surface itself.

One important point must be mentioned here. The engraving is usually wider than the film. Therefore there is an excess of ink which would print on the covered impression cylinder. To prevent this, a "back-grey" is used. This may be cotton, although it is not generally used because the print on the film tends to reproduce the weave of the cloth. Paper "greys" have come into use to get away from this. This "grey" may be the width of the machine, or a narrow roll may be used on either side of the engraving. Some printers use no "grey" at all, but scrape off the excess of ink from the impression cylinder at the end of the work day.

Films vary in formulae. With some it is much easier than with others to obtain a good bond with the ink. This may be due to the plasticizer used in the film, but more often to the lubricant used in taking the film from the calender in manufacturing. Waxes are commonly used, and the result is that a thin wax surface is left on the vinyl film. Some printers soften or dissolve the wax by wetting with butanol or a similar solvent; others preheat the film by passing it over a heated roll; and sometimes the ink will cut through the wax.

After the film is printed, it must be dried beyond the possibility of any blocking when it is rewound on the roll. This is usually done by almost any combination of the following operations: by passing over a heated roll or rolls, by festooning, by passing through a heat tunnel, or by air drying. Usually heat in some form or other is applied, and the film is rewound in continuous operation. If temperatures of 160°F. or over are applied, the film softens and probably stretches somewhat. In order to bring back the film to its original width it often is passed over a cooling roll. Tap water is circulated through the roll, or sometimes the water is refrigerated.

Some films are inherently tacky. When such a film is printed, the tack on the printed portion is increased and cannot be eliminated in drying. To overcome this, the film may be dusted with powdered mica and the excess blown off. This is not recommended, but merely mentioned to illustrate the expedients used to overcome difficulties that are placed in the printer's lap.

Topping

Two new methods of treating vinyl film on the print machine have recently been developed which show signs of running into large volume. The first is "topping," as it is sometimes called. This operation consists of the all-over coloring of heavy-gauge embossed film, i.e., 18 to 45 mil, in order to obtain two-tone effects. As an example, 24-mil film is produced today in large quantities for the luggage, pocketbook, and shoe trades. First it is embossed with, for instance, a lizard design. The film is then "topped"—that is, colored to the proper shade by hand brush. This process is slow and expensive. With hand spraying or "topping," it takes one hour to top a 50-yard roll of 36-inch width, whereas the new method does the same job in 7 minutes or less.

Essentially the process is as follows: The film, often smooth, but usually embossed, is printed with blotch rolls, usually photoengravings with screens from 85 to 185 lines. A blotch roll is so engraved as to print an all-over solid mass of color. The film is fed directly into the print machine to the print rollers and then it travels to an overhead heating chamber where it is dried. Actually, what happens is that the surface of the film has been partially dissolved by the ink. Then the solvents are driven off, leaving the pigment and vinyl binder to become part of the material. The film is then cooled on a refrigerated roller, rewound, and is ready for shipment. The entire process is continuous.

Processing Thick Film

The second development is "processing" thick film. When this material comes off the calender in manufacturing, variations in the uniformity of finish are often

apparent. In some instances the finish may be mat and in other instances it may be glossy. Invariably the pocketbook manufacturer wants what he hasn't, so he takes his glossy film and has the surface matted, or he has a gloss finish put on a dull-finish film. One method, and many feel the best method, of accomplishing this is to print on the finish. The secret of this lies in the special engravings used, coupled with special inks that have been developed. The operation is the same as that heretofore described for topping.

Unit Type Machine

The other style of rotogravure print machine is known as the "unit type." This is conventional for printing cellophane, foil, etc., for the packaging industry. On this machine the printing units are in tandem, and each printing unit has its own impression cylinder. In order to get register of design, constant tension is necessary, and this is very difficult, as the film is pulled through with help of the printing units. Various attachments are required in order to obtain what is called running register, that is, register without stopping the machine, but this becomes a very serious problem with films having a stretch factor, such as a vinyl.

Actually several of this unit type of machine are printing vinyl film in single color, but we do not know of any being used for multi-color printing. As mentioned above, one of the main reasons for this is that printing width limit is 30 inches. Undoubtedly these difficulties will be overcome and new unit type machines will be built for vinyl printing. Right now they are not a large factor.

Another hurdle is cost. A four-color unit type press would cost two or three times as much as a comparable textile print machine. The same basic type of engraving is used and the ink formulations vary only in solvent balance to fit into slightly different drying conditions and printing speeds.

Screen Printing

The total number of screen printers far exceeds those printing by machine methods, but the yardage printed is small by comparison. As a medium of artistic expression, screen printing is unlimited, since delicate effects may be obtained with a low investment in initial equipment. It is essentially stencil printing but not of the simple type used for identification on shipping containers, etc.

For printing on vinyl film, a special type of screen or stencil is required and a separate screen for each color must be made as follows: A silk or nylon screen is first coated with a light sensitized gelatin. The design to be reproduced is placed over the screen and the whole is exposed to light. This film is then made light sensitive by treatment with the proper chemicals. The design to be reproduced is placed over the screen and the whole is exposed to light. The portion of the sensitized film which is exposed to light is rendered insoluble and after the exposure, the screen is washed and that portion of the gelatin which has not been rendered insoluble washes away leaving the screen open in a close reproduction of the design. The screen is dried and is then ready for use on vinyl film.

The printing operation is as follows: The screen on which the design for the first color has been cut is placed on the vinyl film onto which the color is forced through the design by a squeegee. This operation is repeated with each screen until the print is complete.

The entire operation of printing is by hand; hence the cost of the prints runs rather high as compared to roller printing. The same inks are used, however, with certain adjustments for different drying conditions. Usually the prints are air-dried, but some partially mechanized plants have forced drying. A variation of this process is the application of color by air brush instead of by squeegee, but no large volume is involved.

Transfer Method

A new method of printing on cast film is the transfer method. Recently developed, and with patents applied for, it is now in actual practice on a license basis. Several steps are necessary to the process. Briefly, they are as follows:

A special paper was first developed to take a coating of a thermosetting resin of the alkyd type. This coated paper is then printed with a design—either single or multi-color. Special inks are employed, as this print must release readily in the next operation. The resin-coated paper with the print thereon next is used as an apron onto which the solution of vinyl resin flows. As the film dries, the print becomes a part of it; and when it is stripped off, the print comes with it as part of the film. The coated paper may be used again for casting, either with or without a print.

Although this type of printing is more expensive than roller work, the effect is entirely different. More detail is obtained, due to the printing being done on a resin-coated paper that has little or no stretch. Many cast films are inherently tacky and roller prints thereon tend to block. Transfer prints do not block any more than the film itself.

Printing on vinyl film is not simple and it isn't being further simplified by the vast number of new films made up with inferior materials that have been marketed within the last year. However, we feel that it is a new branch of the printing industry and one that is here to stay. There are many guesses as to what its volume will be when textiles become plentiful without government restrictions, but in any event, since it does a better job for many a specific purpose, its future is assured.

Conveyor Belt Process for Crude Latex

A MOVING belt process by which crude latex and coagulants can be fed to a continuous sheeting battery has been developed on a laboratory scale by the B. F. Goodrich Co. at Kuala Lumpur in Lower Malaya. The new method is expected to speed up processing, save factory space, and improve uniformity of the end product.

The process was made possible by development of new "accelerators" which coagulate the latex in one minute instead of the several hours normally required. Fatty acids from cocoanut oil and palm oil, both plentiful and cheap in Malaya, are used in the process and are said to improve the end product.

In the method developed by Goodrich, treated latex and coagulant are fed onto a horizontally moving conveyor belt and pass down a trough with sloping sides. Emerging from the trough in solid form the rubber moves over the conveyor to the sheeting machines. Machined wet sheets have been produced on the experimental machine within three minutes after they have been acidified.

Editorials . . . . . .

Plans for Free Trading

THE increasing need for a workable national rubber policy was made still more evident by events in the past few weeks, particularly the decision of the British Government to reopen the London Rubber Exchange this month, with initial shipments to be made after January 1. Increasing deliveries of natural rubber, which are expected to swell substantially as soon as the political problems in Indonesia are settled, a major step in this direction having been made in the past week, and which are inevitably followed by changes in Rubber Order R-1 increasing the permissible ratio of natural rubber to synthetic rubber in end products, also dictate the need for almost immediate decisions.

Both government and industry strongly favor early restoration of free trade. The government, however, is faced with the problem of maintaining the synthetic rubber industry from a national security standpoint in the face of increasing supplies of natural rubber, while industry fears a chaotic state on prices if controls are relaxed completely and too quickly. Although rubber manufacturers in general have benefited handsomely as a result of the sellers' market which has been existant for the past few years, with profits soaring accordingly, a sharp rise in price of their basic commodity might easily result in financial distress.

Several plans for a revival of free trading are under consideration in government circles. One plan, which is designed to prevent excessive bidding-up of prices, calls for a licensing system tied in with continued allocation. Under this plan, rubber manufacturers would apply to the government for a license to secure a specified amount of natural rubber. If approved, the license would be issued and the manufacturer would then endorse it and turn it over to an importer, who would then purchase the rubber in the open market, but only up to the amount specified on the endorsed license. In this manner, the sponsors of this plan believe, duplication of purchases for a single account could be avoided.

It could well be argued that were such a plan as outlined above be put into operation, the chances are that it would not have to function for more than a three or four month period. The major purpose of the plan is to prevent a run-away price market. It is quite likely that if American importers were permitted overnight to purchase rubber freely in the Far Eastern markets the price would immediately move upward. As greater supplies were made available, the price would tend downward and would eventually find a satisfactory level. The consensus of opinion is that natural rubber will sell at or below 18 cents a pound by the end of 1947. The licensing plan as proposed is specifically designed to prevent prices increasing too rapidly or going too high immediately following the restoration of free trade.

There are those, however, who feel that there is no need of any strings in restoring an early free market in rubber. They argue that no bar need be applied on imports of natural rubber as long as CPA retains control over end use specifications. They also argue that American rubber traders—importers, dealers and agents—are too well versed in the ways of rubber to scramble for natural rubber at any price, and that in view of the fact that prices will substantially decline as supplies increase they will be most cautious in their early commitments. There is even one group which feels that American buyers may not be eager enough to place immediate orders in a free market, since prices will decline and the United States has a fair stockpile on hand, and that it may even be necessary for the Government to reenter the market to make certain that the country secure its fair share of the strategic material.

No matter what plan is eventually adopted for the importation of natural rubber into the United States in an open market, one thing is certain, namely, the synthetic rubber industry must be protected from a flood of cheap natural rubber. To meet this long-range objective it is equally certain that controls of one kind or another over the distribution and consumption of natural rubber must be continued. Continuation of such controls is up to the new Congress, since present legislation, under the Second War Powers Act, expires on March 31, 1947. The rubber manufacturing industry would like to know where it stands, and so it is hoped that Congressional action will be taken as soon after January 3 as possible.

CURRENT NEWS OF THE MONTH

LATEST REVISION OF RUBBER ORDER R-1 PERMITS LARGER USE OF NATURAL RUBBER

THE percentage of natural rubber which may now be used in the manufacture of small and medium size passenger tires, constituting 95% of those manufactured, has been increased from 13 to 23% by the latest revision to Rubber Order R-1. Large passenger tires, formerly allowed only 13% of natural rubber, are now permitted 67%. The revision, officially termed Rubber Order R-1, Appendix II, as Amended October 30, 1946, also permits tires of 11:00-inch cross section and larger of all types, including truck, bus, earth-mover and special purpose, to be made with as much natural rubber as the individual manufacturer wishes to consume. All other types of small pneumatic tires, including small pneumatic industrials with less than 8 plies, may be made with 13% of natural rubber instead of the 2.5% formerly allowed. These major changes, according to W. James Sears, director of the CPA Rubber Division, were made possible by greatly increased receipts of natural rubber.

An important change was also recorded in the variation phase. Heretofore the variation of natural rubber consumption in any one tire size in any one tire group was limited to 5%, provided the stipulated consumption of natural rubber in the tire group was not exceeded. This variation has been relaxed to 10% for all tire groups excepting large truck tires which contain 94% of natural rubber. The variation in this group remains at 5% and, therefore, there will be no all-natural rubber tire smaller than 11:00-inch cross section.

In order that tire manufacturers may familiarize themselves with the problems of producing white sidewall passenger car tires, production of 50 experimental tires with white sidewalls are now permitted in any one month for each tire producing plant. These tires must be marked "Expl" and are to be of standard passenger car tire construction. Tire markings on synthetic tires are no longer required, since the various synthetic constructions are now so grouped in tire sizes that reclaimers will be able to sort tires by size instead of marking.

Increased use of butyl rubber was also provided for in the revision. Tire and flap curing bags, which previously were not permitted to utilize butyl rubber, may now be made with as much natural rubber or butyl rubber as the manufacturer desires.

Advisory Committee Meets

A general program for the first quarter of 1947, calculated to give the public tires and other products with a higher percentage of natural rubber, and at the same time keep alive the war-born synthetic rubber industry as a national defense measure, was approved by the Rubber Industry Advisory Committee at its last meeting, according to a statement issued by CPA on October 22. At the same time the committee recommended the temporary continuation of public purchase of rubber through the Rubber Development Corp. and also that synthetic rubber be produced in quantity sufficient to eliminate necessity of GR-S allocation during the first quarter of next year.

The tentative 1947 rubber utilization program, which would take advantage of an unexpected increase in the supply of natural rubber while following the recommendations of the Inter-Agency Policy Committee on Rubber on the minimum use of synthetic rubber, was outlined at the meeting by Mr. Sears.

The program is based on an estimated use of 1,002,777 long tons of both natural and synthetic rubbers in 1947, compared with an annual prewar use of between 700 and 800 thousand tons. Of this total, 258,000 long tons would be consumed in the first quarter. Approximately 50 per cent of this amount would be natural rubber, which would insure the consumption of synthetic rubber at the level required to meet the objectives of IPCR.

This program could be met even if specifications were relaxed to permit 100 per cent natural rubber airplane, truck and bus tires; 50 per cent natural rubber passenger tires in 7:00 inch cross-section and larger, and 33 per cent natural rubber in smaller passenger tires, Mr. Sears said.

Estimates of natural and synthetic rubber consumption for the three remaining quarters of 1947 could not be discussed with any accuracy, the committee said. The Second War Powers Act expires March 31, 1947, and if no other controls are established on natural rubber usage, demands might exceed the supply, which could affect the level of United States imports.

It was also pointed out that in the absence of controls, the price differential between natural and synthetic rubber would affect consumption. Also, Congress has not acted upon the IPCR recommendation for a continuing consumption of synthetic rubber. In view of these uncertainties, it was agreed that the program could cover only the first quarter of 1947.

Members of the committee said that specifications and allocation controls such as are provided in Rubber Order R-1, under which the rubber program operates, should be continued until at least March 31. It was also suggested that similar controls will be needed to keep the synthetic rubber industry alive after the Second War Powers Act expires.

The advantages of the synthetic rubber industry in national defense were stressed in committee discussions, and the committee agreed to study what type of control on the manufacture of rubber products should be recommended to Congress to implement the recommendations of IPCR.

In connection with contemplated policy on rubber, it is interesting to note that on November 9, John R. Steelman, Director of Reconversion, stated that the purchase of natural rubber by the United States Government will not be abandoned "in the near future." Mr. Steelman took cognizance of the rumors that an early return to free trade in this country was imminent, but warned that no official step in this direction had yet been made.

Free Market in London

Meanwhile, in a major bid to recapture some of Britain's international business, the British Board of Trade announced on November 5 that Britain will restore private trading in rubber and permit re-establishment of the London rubber market as of November 18. It was stipulated, however, that contracts for buying or selling physical rubber must be made for delivery after January 1, 1947, and that for the time being liquid latex and sole crepe were exempted from the open market.

Pointing out that the rubber market will be the first major commodity exchange permitted by the Labor Government to reopen, H. P. Marquand, sec-

retary of the Overseas Trade Department of the British Board of Trade, said that the decision "follows upon the rapid improvement in the natural rubber position in the last few months." He added that supplies in the Far East have exceeded all expectations and that "there have been discussions between the appropriate departments and the Rubber Trade Association in London so as to allow the effective functioning of the market under conditions of exchange control so as to limit as far as possible undesirable speculative financial transactions under cover of the market."

In connection with the announcement of the restoration of free trade, Mr. Marquand revealed that as of September 27 the British Government held 138,958 tons of rubber, including 2,485 tons of synthetic rubber. As of that date, he said, British rubber manufacturers held 17,058 tons of natural and 2,668 tons of synthetic rubber.

The British decision to restore free trading met with favorable reaction in rubber circles in Amsterdam, despite the fact that disturbed conditions pending settlement of the political situation in the Netherlands Indies are still preventing resumption of normal rubber production in that area. These Dutch circles point out that restoration of the free market meant that when Indies production is eventually resumed in full and exports begun on a large scale a market will exist in which rubber can be absorbed and distributed.

New Rubber Parley Set

The next meeting of the Rubber Study Group, composed of representatives from the United States, Great Britain, France and the Netherlands, is scheduled to be held at The Hague in Holland, starting on November 25. It will be the fourth meeting held by the group, and is expected to focus attention on the problem of rubber supply from the Far East. The meeting should result in some interesting sidelights, in view of the fact that international allocation of rubber will be terminated by the end of the current year and the restoration of free trade by the British.

Donald D. Kennedy, chief of the International Resources Division of the Department of State, will be the United States delegate at the meeting, with William T. Phillips, special assistant on commodity policy of the division, as his alternate. Advisers to the American delegate include P. W. Litchfield (Goodyear), John L. Collyer (Goodrich), A. L. Viles (R.M.A.), Alan L. Grant (Rubber Development), E. G. Holt (Commerce Department), George M. Tisdale (Combined Rubber Committee), H. C. Bugbee (London Embassy), and W. L. Batt. The latter is chairman of the Inter-Agency Policy Committee on Rubber.

The availability of increased supplies of natural rubber, particularly from Malaya, is bound to occupy the attention of the Holland meeting. In this connection it is interesting to record that conflicting reports have been issued regarding the ability of Malaya to meet the 200,000 tons to be acquired by the United States before the end of the current year under its latest agreement with the British Government.

One report from Singapore, dated October 29, indicated that Malaya would fall short of meeting the amount by some 50,000 tons. On the other hand, H. L. Barnett, Registrar of Statistics for the Malayan Union, announced on October 30 that Malaya would have little trouble in supplying the entire 200,000 tons.

He pointed out that stocks held by Peninsula and Singapore dealers and estates at the end of September totaled 120,000 tons and that September production reached 43,232 tons. Should production be maintained at the 40,000-ton level in October, November and December, he said, it would swell Malaya's stocks to 240,000 tons, not including imports from the Netherlands Indies.

It is the general consensus of those most familiar with Malaya's status, that the full 200,000 tons will be supplied from Malaya, without drawing on stocks in Great Britain, which is provided for in the agreement.

Tire Production Increasing

The latest over-all production report of the Civilian Production Administration reveals that passenger and motorcycle tire production in September again broke all postwar monthly records, reaching approximately 5,900,000 tires, or an annual rate of almost 71,000,000 units. In spite of the short month, September output was 2% above the August level of 5,800,000 tires. It now appears certain that the 1946 goal of 66,000,000 passenger car tires, established more than a year ago, will be reached or exceeded.

The CPA report also indicated that September output of truck and bus tires rose 8% from 1,300,000 in August to 1,400,000. Production for 1946 will materially exceed the earlier goal of 13,500,000 tires and is now scheduled to reach 15,400,000 units.

On November 7 CPA announced that the restriction against selling a spare tire with a new passenger car will remain in force because of the continued shortage of tires in general. The decision was based on a study, completed during October, which revealed that passenger car and small truck tire demand was greater on October 1 than on June 1. The survey involved two separate nationwide spot checks and an analysis of replacement tire shipments during the summer months.

The fourth quarter export quota for truck and bus tires was set at 450,000 on October 22, approximately 1% of estimated production. The quota for passenger car tires was pegged at 350,000, or about 1.8% of estimated production. The third quarter export quotas were 425,000 truck and bus tires and 300,000 passenger car tires.

All Price Controls Dropped

In accordance with the general order issued by President Truman on November 10, covering all foods, materials, etc., other than sugar, rice and rents, price regulations on all rubber products, as well as materials and supplies furnished to the industry, have been eliminated. Prior to the general decontrol order, and since our last report, OPA announced increases in the ceiling prices of certain mechanical goods and in the price of dibutyl phthalate. It had also announced the exemption from price control of a number of rubber products, as well as furnace carbon blacks, chlorinated natural rubber, and rubber paints.

Goodyear Starts Tube Unit

Goodyear Tire & Rubber Co. has announced that initial production has been started in its recently completed $4,000,000 tube manufacturing plant at Gadsden, Albama. This new unit, 250 feet wide and 560 feet long, will have the largest capacity of any tube manufacturing plant in the country. One production line is already operating and equipment for two others is being installed.

To Build Tire Plant in Peru

B. F. Goodrich Co. has reported that arrangements have been completed with Peruvian interests for the construction of a tire and tube factory in Lima, Peru, to be completed late in 1947. The new plant in the Peruvian capital will have capacity for the manufacture of approximately 50,000 tires and tubes annually. Goodrich will provide all technical and engineering services.

Eagle-Picher Acquires Plant

The Eagle-Picher Co., Cincinnati, Ohio, manufacturers of lead and zinc products, insulation, and building materials, has acquired the East Chicago, Ind., plant of the International Smelting & Refining Co., a subsidiary of the Anaconda Copper Mining Co. The acquired plant includes a large group of buildings centered around lead refinery operations, the manufacture of zinc oxides, and the electrolytic process of making white lead.

Names Vice-Presidents

Fletcher P. Thornton and Oliver P. Arnold, both of whom have been associated with Stowe-Woodward, Inc., Newton Upper Falls 64, Mass., for the past twenty-six years, have been elected vice-presidents of the company. The company also has announced that William E. Greene has been elected chairman of the board.

NEW MATERIALS SPECIFICATIONS ACCEPTED BY ASTM COMMITTEE

On the recommendation of several of its technical committees, the American Society for Testing Materials, through its Administrative Committee on Standards, recently approved numerous new and revised specifications and tests, including those on rubber and adhesives. Approval of new tentatives included test methods for Resistance of Adhesive Bonds to Chemical Reagents (D-896-46-T) and for Tensile Properties of Adhesives (D-897-46-T).

In the direct rubber classification, revision of nine tentatives was approved, including specifications for the following: Insulated Wire and Cable: Class AO, 30% Hevea Rubber Compound (D-27-46-T); Rubber Sheath Compound for Electrical Insulated Cords and Cables (D-532-46-T); Insulated Wire and Cable: Ozone-Resistant Type Insulation (D-574-46-T); Insulated Wire and Cable: Heat-Resisting Synthetic Rubber Compound (D-754-46-T); and Insulated Wire and Cable: Performance Synthetic Rubber Compound (D-755-46-T).

The other four revisions of rubber tentatives covered test methods as follows: Testing Rubber Hose (D-380-46-T); Testing Rubber-Insulated Wire and Cable (D-470-46-T); Testing Rubber-Coated Fabrics (D-751-46-T); and Identification and Quantitative Analysis of Synthetic Elastomers (D-833-46-T).

Changes in Rubber Tentatives

The change in the Tentative Requirements for Rubber Sheath Compound D-352 eliminates vulcanizing in a metal mold, which test is considered superfluous, providing the physical requirements properties are met. The Ozone-Resistant Type Wire Insulation D-574 will have the value of the constant K in the formula for insulation resistance changed from 5280 to 2000. During the war, this constant was dropped to 1000 in the emergency alternate provisions. In effect, therefore, this change increases the constant to 2000. This value is the same as now used in D-754 and D-755 covering synthetic rubber insulations.

Revisions in the Heat-Resisting Synthetic Rubber Compound Specification D-754 will permit the use of some natural rubber when this becomes available and will include additional types of conductors with the 1/32 in. wall. In another specification for insulated wire and cable, performance synthetic compound (D-755), the use of natural rubber, and additional types of conductors are included, and further the aging requirements are made more rigorous, which is an improvement and which the manufacturers can meet.

The Methods of Testing Rubber Insulated Wire and Cable (D-470) are to include the horizontal flame test which had appeared during the war as an emergency revision. The change in the Test for Rubber Hose (D-380) will permit the use of a certified test slab from the same material as used in the hose in cases where the material is so thin that the minimum requirement of 1/32 in. cannot be made available.

A new alternate method which is particularly applicable to fabrics having low resistance to passage of moisture has been incorporated in the various tests for rubber-coated fabrics as established in D-751. This involves the Suter equipment. The adhesion test procedure is being modified so that the results should give a better average figure instead of the maximum values.

Of particular interest in identifying and analyzing synthetics is the incorporation in D-833 of spot tests, representing utilization of the results of recent work. These tests are more rapid and considered fully as reliable as those replaced.

Methods of Testing Adhesives

The new methods of testing adhesives —the first, Tensile Properties of Adhesives, D-897; the other, Resistance of Adhesive Bonds to Chemical Reagents, D-896—are the first that have resulted from the relatively new Committee D-14 on Adhesives. There is intensive demand for test methods for evaluating different types of adhesives and possibly also for performance type specification but the committee has for the past year or two been concentrating its work on test methods.

The tensile test will determine comparative properties of adhesives, using a standard shape specimen with specific conditions of pre-treatment, temperature and testing speed. The requirements give specific dimensions on the test specimens and their quality (whether wood or metal), the gluing and conditioning, the number of specimens (at least 10 must be tested), and the general procedure.

The new test for resistance of adhesive bonds to chemical reagents requires the use of the other new test for tensile properties, D-897. The testing procedure requires that each specimen shall be in a separate container, totally immersed in the reagent for 7 days at a temperature between 25° and 30° C, and the reagent is to be stirred every 24 hours. After rinsing with distilled water and drying, the specimen is tested immediately. Various standard chemicals are listed, including sulfuric acid of various strengths, sodium hydroxide solutions, various alcohols, and others.

Copies of all of the new and revised A.S.T.M. specifications will be available during the Fall from A.S.T.M. Headquarters, 1916 Race St., Philadelphia 3, Pa., at 25c each. They are also being included in the new 1946 Book of A.S.T.M. Standards to be issued in December-February, in five parts.

Chemists Directory Available

The Association of Consulting Chemists and Chemical Engineers, Inc., 50 East 41st St., New York 17, N. Y., has issued the 1946 edition of its classified directory of members. The directory contains a record of the various services performed by the members of the Association, descriptions of the qualifications, scope, functions, and activities of each member's organization, and an alphabetical listing of each member and his address.

One of the first pictures of natural rubber production to reach this country since the war shows natives collecting latex from trees on one of the Malayan plantations of the U. S. Rubber Co.

RUBBER SECTION OF N.S.C. HOLDS MEETING IN CHICAGO

The annual meeting of the Rubber Section of the National Safety Council was held at the Congress Hotel in Chicago, Ill., on October 7 and 8, in conjunction with the 34th annual meeting of the parent society. The two-day meeting of the Section featured the presentation of seven technical papers, including a symposium on "Vision and Safety in the Rubber Industry," election of officers, and a review of the Section's activities.

In opening the meeting on October 7, J. E. Lovas (U. S. Rubber), the retiring general chairman, briefly discussed the activities of the Section for the past year. He reported that the official membership had remained constant at 74 throughout the year, with several companies terminating their membership, and an equal number of new ones obtaining new membership. Concerning the Section's publication, Mr. Lovas revealed that twelve issues of the News Letter had been published during the year, a number of Safety Instruction Cards had been printed, and material had been collected for two new Safe Practices pamphlets.

Officers for 1946-47 Season

The following officers were elected by the Section for the 1946-47 season: *General Chairman,* Roland Kastell (U. S. Rubber); *Vice-Chairman,* Glen D. Cross (Firestone); *Secretary,* H. L. Andrews (Firestone). The following members were elected chairmen of the various committees: *Engineering,* George Burkhardt (General Tire); *Health,* Dr. J. Newton Shirley (Arrow Mutual Liability Insurance); *Membership,* R. M. Boyles (Midwest Rubber Reclaiming); *Poster,* T. H. Boyd (Manhattan Rubber); *Statistics,* M. E. Badstuber (Ohio Rubber). In addition, Gordon Trank (Hewitt-Robins) was named News Letter Editor, and C. E. Beck (St. Clair Rubber) was appointed to handle publicity for the Section.

Vision and Safety Symposium

The technical program of the first day was devoted to a rather comprehensive symposium on "Vision and Safety in the Rubber Industry." The symposium featured papers on *Vision,* by Joseph Tiffin, of the Division of Education and Applied Psychology of Purdue University, Lafayette, Ind., *Illumination* by Carl Jansen, district engineer of the Westinghouse Electric Corp., Chicago, Ill., and *Color and Arrangement,* by H. Ledyard Towle, director of color engineering, paint department, Pittsburgh Plate Glass Co., Pittsburgh, Penna.

In his talk, Mr. Tiffin discussed visual testing and the improvement of visual conditions by testing and training so as to set people physical tasks which are within their physical capabilities, and to train the individuals to the highest efficiency in the performance of these tasks. Mr. Jansen spoke on the technical means of supplying a sufficient quantity of high quality illumination at the point where it is required, while Mr. Towle lectured on the use of color schemes to increase the visibility of the job on hand.

The program for the first day was concluded by Anita Blair, a young lady who was totally blinded in an automobile accident several years ago. She gave an inspirational talk on the prevention of industrial eye accidents.

The technical program of the second day featured the presentation of three papers, as follows: *What Are Compensable Accidents,* by Harry A. Nelson (Wisconsin Industrial Commission); *Prevention of Windup Accidents,* by Walter Schneider (B. F. Goodrich), and *Worker's Cooperation in Safety,* by R. P. Blake (U. S. Department of Labor).

Coming Events

Nov. 21. Northern California Rubber Group, Angelo's, Emeryville, Calif.

Nov. 22. Akron Rubber Group, Hotel Mayflower, Akron, Ohio.

Dec. 2-6. A.S.M.E., Annual Meeting, Hotel Pennsylvania, N.Y.C. (Rubber & Plastics Division meets on December 2, morning and evening sessions.)

Dec. 6. Boston Rubber Group, Xmas Party, Boston, Mass.

Dec. 13. New York Rubber Group, Xmas Party, Hotel McAlpin, New York City.

Dec. 13. Detroit Rubber & Plastics Group, Xmas Party, Detroit-Leland Hotel, Detroit, Mich.

Dec. 20. Chicago Rubber Group, Xmas Party, Hotel Morrison, Chicago, Ill.

Jan. 30. Northern California Rubber Group, Oakland, Calif.

Feb. 24-28. A.S.T.M., Spring Meeting and Committee Week, Hotel Benjamin Franklin, Philadelphia, Pa.

Apr. 14-18. A.C.S., 111th Meeting, Atlantic City, N. J.

June 16-20. A.S.T.M., Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Sept. 15-19. A.C.S., 112th Meeting, New York City.

Arranges $75,000,000 Credit

Goodyear Tire & Rubber Co., Akron, has announced an arrangement with a group of banks for a five-year revolving credit of $75,000,000, with an initial discount rate of 1½%. Although the company has no bank loans at present and does not anticipate any nearby use of this credit, it was deemed advisable to provide for the possible need of additional working capital.

WIRE FOR RUBBER PRODUCTS BEING PRODUCED COMMERCIALLY

In an announcement made in New York City on November 5th, the American Steel & Wire Co., subsidiary of the United States Steel Corp., revealed that it has developed and is now producing in commercial quantities an exceedingly fine steel wire which it predicts will largely replace textile products in the manufacture of heavy-duty tires. Manufacture of the wire, which is only .0059 of an inch in diameter, is being carried out at the Cleveland plant of the company.

Steel Used to Form Plies

Wire has already been used extensively in tires to provide a core for the bead which holds the casing on the rim of the wheel. The new steel strands are used to form the plies or layers of material which are saturated with rubber and form the inner core or body of the tire. Used in heavy-duty tires during the war, the product proved of value in providing longer life for casings and conserving critical rubber.

Three of the fine wires are twisted into a strand and six strands are laid around a central core to form a cord one thirty-second of an inch in diameter. Numbers of these cords are then placed parallel with each other and coated with rubber, forming a ply of great strength and resistance for use in tire construction. When three or four of these plies are laid with the wires in each running at an angle in the next ply, a strong, flexible foundation is afforded for applications of the tread rubber.

Four metallic plies are equivalent in strength and durability to approximately twenty fabric plies commonly used in heavy-duty tires, according to the company spokesmen. More rubber is required to saturate one metallic ply than a fabric ply, but the over-all saving in rubber due to the fewer plies is very substantial, it was pointed out.

Advantages of Metal Sheath

The metal sheath formed by the process, it is also claimed, shows much greater resistance to punctures, bruises and blowouts and the thinner structure provides greater resiliency and eliminates the creation of excessive heat which is so destructive to rubber. The metal core ply also eliminates casing stretch, which lowers the density of tire rubber and contributes to wear.

Due to the flexing to which the cords are subjected, the wire used in their production must be of extremely high grade, with tensile strengths ranging from 325,000 to 400,000 pounds a square inch. The most rigid controls are exercised in the manufacture of the steel and in the subsequent drawing of the wire and forming of the cords.

The product, the company also claimed, lends itself to a number of other uses, such as reinforcement for V-belts, power transmission and conveyor belts.

NEW SOUTHERN OHIO GROUP HOLDS INAUGURAL MEETING

The inaugural meeting of the recently-created Southern Ohio Rubber Group was held at the Van Cleve Hotel in Dayton, Ohio, on October 24. The meeting was attended by approximately 150 people, with more than 100 becoming charter members of the group during the evening. The committee responsible for the meeting and the creation of the new group consisted of E. C. Dill, R. R. Hickernell, J. E. Feldman, and H. E. Wening, all of the Inland Manufacturing Division, General Motors Corp., Dayton.

The meeting was opened by Mr. Dill, who acted as toastmaster for the night. After a brief welcoming address, Mr. Dill introduced Mr. Feldman who explained the purposes of the proposed group. A motion was then made from the floor that the Southern Ohio Rubber Group be organized, the motion being unanimously approved.

Mr. Feldman then stated that a nominating committee had been formed which would conduct the election of officers by letter ballot. The new officers will officiate at the next meeting, scheduled to be held in February. The February meeting, it was said, would probably feature a symposium on latex. The elected officers will prepare a proposed constitution for the group, which will be presented for discussion and approval at the meeting. Dues for the group were set at $3.00 per year.

Dinner music was provided at the meeting by a trio. Unusual entertainment was provided by Robert Lewis, who presented a novel magic act under the title of "Sophisticated Mystification" and who also gave an excellent characterization of the fast-disappearing street hawker, and by Max Sauer, author, humorist and editor of the *Leesburg (Ohio) Citizen*. Dr. Sauer, who was scheduled to deliver an address on "What About Rubber?," actually delivered a down-to-earth philosophical talk, spiced with typical country humor and anecdotes, ranging from religion to politics. M. E. Lerner, editor of RUBBER AGE, also gave a short talk on the organization of different rubber groups.

Members of the Nominating Committee, which will conduct the election of officers for the group by letter ballot, include the following: E. C. Dill (Inland Mfg.), chairman, B. Adinoff (Dayton Rubber), W. T. Reed (New Bremen Rubber), George E. Lang (Premier Rubber), and Carl Cramer (Cabot). A Membership Committee has also been formed, consisting of the following: J. W. Whiteside (Inland Mfg.), H. W. Bell (Firestone), N. C. Dworack (Rubber & Plastics), John Walsh (Xylos Rubber), A. J. Marshall (Naugatuck Chemical), V. K. Hitch (Akron Chemical), R. S. Radow (Dayton Rubber), and H. Gill (St. Marys Rubber).

At the conclusion of the meeting some 30 prizes were distributed to holders of lucky number tickets. Contributors who made both the meeting and the distribution of prizes possible include the following companies: Akron Chemical Co., L. Albert & Son, American Cyanamid Co., American Zinc Sales Co., Amsco Products Co., Barrett Division of Allied Chemical & Dye Corp., Binney & Smith Co., Stewart Bolling & Co., Godfrey L. Cabot, Inc., Caldwell Co., Carter Bell Mfg. Co., Continental Carbon Co., Carl Cramer Co., Dow Corning Corp., Dugan & Campbell, DuPont, Durez, Inc., Farrel-Birmingham Co., B. F. Goodrich Chemical Co., C. P. Hall Co., Herron Bros. & Meyer, J. M. Huber, Inc., S. C. Johnson Co.

Also Midwest Rubber Reclaiming Co., Monsanto Chemical Co., H. Muehlstein & Co., Naugatuck Chemical, N. J. Zinc Co., Ohio Oil Co., Pequanoc Rubber Co., Phillips Petroleum Co., Pittsburgh Plate Glass Co., Precision Scientific Co., RUBBER AGE, Sol Slavin Co., Stamford Rubber Supply Co., Stanco Distributors, Inc., Standard Chemical Co., Sun Oil Co., United Carbon Co., U. S. Rubber Reclaiming Co., R. T. Vanderbilt Co., Witco Chemical Co., Xylos Rubber Co.

Aluminum in Tires

The end of the recent war saw the introduction of aluminum foil into many peacetime products. Many other applications for this relatively new material are still in the development stage. Among the latter is the possibility of adapting aluminum foil thread for use in tire fabric, since the metal dissipates heat. Several of the major tire companies are known to be experimenting with such fabric.

Remove GR-S Export Curb

Restrictions pertaining to the export of GR-S, in both the dry and latex form, imposed some four months ago when domestic supplies began to tighten up, have been removed by CPA, as of November 1. This leaves only GR-I (butyl) still under export restrictions. In view of the fact that natural rubber latex is still in short supply, CPA anticipates some demand for GR-S latex from the foreign field, but does not expect too large a demand for the dry rubber. The amount exported before restrictions were imposed was not great, with France and Mexico recorded as the best customers.

Philipp Brothers Moves Office

Philipp Brothers Chemicals, Inc., has moved its headquarters to 37 Wall Street, New York 5, N. Y. The company also has branch offices and warehouse stocks in Boston, Mass., Providence, R. I., Hartford, Conn., Philadelphia, Penna., and Baltimore, Md.

RUBBER PROCESSING SYMPOSIUM PRESENTED BY NEW YORK GROUP

The Fall Meeting of the New York Rubber Group was held on October 18 at the Hotel McAlpin in New York City, with approximately 400 members and guests in attendance at the technical session in the afternoon and about 350 present at the dinner in the evening. The technical part of the program featured an unusual symposium on "Processing of Natural and Synthetic Rubber." Divided into three panels, the symposium covered the practical side of the mixing, calendering, and extrusion processes.

Each panel discussion was introduced by an expert on rubber machinery who presented a paper on his particular subject. Donald A. Comes, assistant sales manager of Farrel-Birmingham Co., Inc., Ansonia, Conn., spoke on "Mixing Equipment," while G. V. Kullgren, manager of the Contract Engineering Division of Adamson-United Co., Akron, presented a paper on "Calendering Equipment," and J. F. Allen, manager of the rubber machinery division of National-Erie Corp., Erie, Penna., discussed "Extrusion Equipment."

After the presentation of the opening papers, each panel group leader advanced questions, submitted in advance, which were answered by other members of his panel. Questions ranged from "What precautions must be taken in Banbury mixing to prevent fires when sulfur is added to the mix?" to "Can you supply processible all-carbon black formulas at 50 Durometer hardness made from standard GR-S and GR-M—processibility to be judged by smooth calendering and extrusion, and retention of dimensions of the calendered or extruded stock?" The latter question was placed before all three panels. An informal period, with questions being raised from the floor, concluded each panel discussion.

Members of the panels were as follows: *Mixing:* E. N. Cunningham (Stanco Distributors), F. B. Dahlinger (Raybestos-Manhattan), Dr. George D. Kratz (Norwalk Tire), and J. A. Scellen (Pequanoc); *Calendering:* O. I. Lang (Armstrong Rubber), R. R. Lewis (Vulcan Proofing), Henry B. Morse (Endicott-Johnson), A. F. Schildauer (Du Pont), and W. E. Scoville, Jr., (U. S. Rubber); *Extrusion:* T. K. Cox (Western Electric), J. J. Millard (U. S. Rubber), and O. J. Lang (Armstrong Rubber).

Plans for the publication and distribution of a complete transcript of all of the questions raised and the replies rendered, including the full papers read by each panel leader, are now being considered. Some decision in this regard will be reached shortly and will be disclosed to the members of the group.

In addition to an enjoyable dinner, a short program of entertainment was provided, consisting of several variety acts. An accordionist furnished music before and during the dinner hour.

TALKS BY BOSS AND WHITE HEARD AT CONNECTICUT GROUP MEETING

Approximately 100 members and guests who attended the Fall Meeting of the Connecticut Rubber Group, held on November 8 in the auditorium of the United Illuminating Co. in New Haven, Conn., heard interesting talks by Dr. A. E. Boss, manager, pigment sales, Columbia Chemical Division, Pittsburgh Plate Glass Co., and Dr. L. M. White, of the research and technical development department of the U. S. Rubber Co. Dr. Boss spoke on "New GR-S Types," while Dr. White discussed "Laboratory Evaluation of Processability of Elastomers."

Dr. Boss discussed mainly X-numbered GR-S from the point of view of the effect of changes in the production process on the properties of the polymer. He said that the advantage of synthetic rubber, in general, is that within limits it can be "tailor made" to suit the requirements of the consumer. In the production of GR-S, variations can be made in the monomer ratio to produce a whole series of polymers differing in thermoplasticity, in freeze point, and in some physical properties. Also, by using different monomers, some of the properties can be changed, the speaker stated.

Different dispersing agents were said to introduce changes in properties as do different degrees of conversion of monomer to polymer. New stabilizing agents were described as having made possible the production of light colored and non-staining goods and new coagulation means to have produced polymers with extremely low water absorption properties.

Masterbatches of difficultly dispersible pigments can be made, Dr. Boss said, and a good range of average particle size and of total solids content is available in the various latices now being produced. From the wide variety of GR-S types available or potentially available the compounder may now select polymers especially suited to particular end products.

In his talk, Dr. White declared that determination in the laboratory of the behavior of elastomers under factory conditions to a large extent can only be accomplished by empirical methods suggested by the factory process. Because the methods are mostly empirical, they are not infallible, but they have been used very successfully in developing improved processing synthetic rubbers.

Whether or not an elastomer has good processability depends upon the particular process in which it is to be used, Dr. White said. Footwear fabrication requires one set of properties; tire fabrication another. In complete laboratory evaluations the processing properties important in a hypothetical average process must be determined. The interpretation of the complete laboratory evaluation, however, must consider the particular process in which the elastomer is to be used.

Analysis of the behavior of an elastomer in the average process was said to have suggested that the following laboratory tests on the polymer and its compounds should provide a comprehensive evaluation: viscosity-temperature relation for raw elastomer from 100 to 300° F.; rate of breakdown at mixing temperatures; viscosity increase on adding filler; viscosity temperature relation for the compound; scorch time at highest processing temperature; calender shrinkage or tuber swell at preforming temperatures; roughness of calendered or tubed piece; tubing speed; and tack.

Ontario Section Hears Davies

Thomas L. Davies, director of the pilot plant of the Polymer Corp., Sarnia, Ont., was the principal speaker at the first meeting of the 1946-47 season of the Ontario Rubber Section of the Chemical Institute of Canada, held at the University of Toronto in Toronto, Ont., on October 15. Approximately 60 members and guests attended the meeting which was preceded by dinner at the Hart House. In a talk on "New Types of Elastomers," Mr. Davies dealt with the various numbered GR-S types and "X" polymers and the various uses to which they are put. The requirements of general purpose and high solids latex together with how the work is progressing on fulfilling these requirements was discussed, with special reference being made to Type III and modifications, GR-S Type 5, and "X"-288. Mr. Davies said that a review is currently being made of information on German Buna S-III type polymers which have been produced at an American pilot plant. Figures were given on road tests carried out several months ago on GR-S vs. Buna S-III. Reference was also made to the Redox system on which work has been started on a pilot plant scale. A short film, entitled "B for Rubber," was also shown.

Akron Group Announces Speakers

The Akron Rubber Group has announced that the principal speakers at its Fall Meeting, to be held at the Mayflower Hotel in Akron on November 22, will be Charles J. Mighton and E. L. Stangor, manager and rubber technologist, respectively, at the new laboratory of the Rubber Chemicals Division of E. I. du Pont de Nemours & Co. in Akron. Mr. Mighton will discuss "New Outlets for Rubber Through Latex," while Mr. Stangor will speak on "Backrinding of Molded Products."

Establish New Research Project

Under the sponsorship of the Office of Rubber Reserve of the Reconstruction Finance Corporation, a new research project has been established in the Chemical Engineering Department of the University of Rochester at Rochester, N. Y. The purpose of the project is to obtain fundamental data underlying the recovery of unreacted monomers from synthetic rubber latices. The work is under the direction of O. E. Dwyer.

TOBOLSKY IS FEATURED SPEAKER AT MEETING OF DETROIT GROUP

Approximately 135 members and guests heard Dr. Arthur V. Tobolsky, professor of chemistry at Princeton University, Princeton, N. J., talk on "Physical Properties and Molecular Structure of Natural and Synthetic Rubbers" at the Fall Meeting of the Detroit Rubber and Plastics Group, held at the Detroit-Leland Hotel in Detroit, Mich., on October 18. Dr. Tobolsky's talk was accompanied by illustrated slides.

In his talk, Dr. Tobolsky said that the methods of continuous and intermittent relaxation of stress at constant extension provide a means of following the structural-chemical changes that occur in rubber networks at elevated temperatures. These changes include chain scission and chain cross-linking induced by molecular oxygen as well as bond interchange, hydrolysis and depolymerization. Among the rubbers studied were natural rubber, the bunas, butyl, neoprene, lactoprene, polyesters, polysulfide and silicone rubbers.

As can well be expected, the speaker stated, these materials show a tremendous variation in relaxation characteristics which can be correlated with their chemical structure. A theory of permanent set of elevated temperatures which gives satisfactory agreement with experiment has been developed in terms of the concepts of scission and cross-linking.

Dr. Tobolsky pointed out that at sufficiently low temperatures stress relaxation provides a means of measuring the stability of secondary forces between the network chains and comparing the cold-resistance of various rubbers. Interesting effects were said to occur in rubbers which crystallize at low temperatures. At intermediate temperatures, stress relaxation provides a means of following the extent of vulcanization and also provides a means of distinguishing between cross-linked and non-cross-linked polymers, the speaker said.

The December Meeting of the Group will be in the form of a Christmas Party, scheduled to be held on Friday, December 13, at the Detroit Leland Hotel. No speakers for the meeting have been announced at this writing.

Chicago Party on December 20

The annual Christmas Party of the Chicago Rubber Group will be held on Friday, December 20, in the Terrace Casino of the Morrison Hotel in Chicago, Ill. This event is the highlight of the group's season of activities, since it is the only meeting of the year which is devoted exclusively to entertainment of members, their wives, and their guests. In addition to the distribution of prizes, each lady will be presented with a special gift with the compliments of the group. Tickets for the meeting may be secured from J. Frank Taylor, committee chairman, at the Commercial Solvents Corp., 1817 West Fullerton St., Chicago, Ill.

BRADY AND WINKELMANN ADDRESS CHICAGO GROUP

The November Meeting of the Chicago Rubber Group, which featured talks by Joseph L. Brady, of Naugatuck Chemical Division of the U. S. Rubber Co., and Dr. H. A. Winkelmann, director of research of the Dryden Rubber Co., was held at the Morrison Hotel in Chicago, Ill., on November 1. Mr. Brady spoke on "Present and Future Synthetic Rubber Polymers and Their Place in Industry," while Dr. Winkelmann discussed "History of the Rubber Industry in Chicago."

In his talk, Mr. Brady classified the various GR-S polymers under seven types and described the reasons for each classification, and the various advantages, disadvantages, and special properties of each polymer in each group. Variations in viscosity was described as the first classification.

Special polymers having greater tackiness than regular GR-S were grouped in the second set. In this respect GR-S-10 is widely used in tires, soles and heels, and belting. For uses where non-discoloration or non-staining is essential special polymers such as GR-S-25 and GR-S-40 must be employed. The former is used for general compounding where a very pale color is desired and the latter in soles and heels and wire insulation. An outstanding development in this group is X-317-AC which is especially adapted to chemically blown sponge rubber products because of its very pale color, low viscosity (45 Mooney), less discoloration in light, and less staining of paper and cloth.

The speaker said that in products such as wire insulation it is essential that the synthetic be especially prepared to have a very low water absorption. For this property the polymer is coagulated without salt or with alum alone.

Since processing of synthetic rubber has always been a difficult problem, several special polymers have been devised to obtain better processing than the standard. GR-S-X-285 was described as differing from standard GR-S by the addition of 0.5% of a cross-linking agent. When used as only part of the total polymer, it markedly reduces the amount of shrinkage after milling and the swelling of extruded material. GR-S-X-344 is the non-discoloring type similar to GR-S-X-285.

Masterbatches of carbon black and GR-S were described as the sixth group. Figures were presented to demonstrate that such masterbatches offer considerable advantages in cost and quality over GR-S mixed with black by regular methods.

GR-S latices of the newer types were also described. Of particular interest were the high solids, latices which are made without concentrating equipment and are therefore considerably lower in cost than standard latex.

In his talk on "The History of the Rubber Industry in Chicago," Dr. Winkelmann traced the beginnings of the rubber manufacturing industry in the "Windy City."

Ross Morris—A Biography

Ross E. Morris

Ross E. Morris, who was the principal speaker at the October meeting of the Northern California Rubber Group, as reported elsewhere on this page, is senior rubber technologist at the rubber laboratory of the U. S. Naval Shipyard at Mare Island, Calif. A native of Los Angeles, Mr. Morris was graduated from the California Institute of Technology in 1932 with a master's degree in chemical engineering. In 1933, he was awarded the Goodyear Fellowship at the University of Akron in Akron. Joining the Goodyear Tire & Rubber Co. in 1934 as a research chemist, he was made a compounder at the company's Plant 2 in Akron the following year, and served in the same capacity at the Goodyear plant in Los Angeles in 1936 and 1937. After serving as chief chemist of the Kelly-Springfield Tire Co. in 1938, he left that company to join the Mare Island Naval Shipyard in 1939. Some of the important investigations which Mr. Ross directed at Mare Island are as follows: compounding of guayule rubber, development of accelerated weathering test, compounding of stocks to meet all Navy specifications, development of improved method for rubber lining submarine battery compartments, measurement of efficiencies of oil hose, and development of cold resistance tests. Mr. Morris is author or co-author of some 27 papers on rubber chemistry and technology and holds several patents.

Perfects New Wire Tire

A new wire tire which is said to be blowout-proof has been perfected by the U. S. Rubber Co. The new wire tire is reported to offer the following features: no loss of carcass strength due to heat, greater rupture resistance, improved carcass separation resistance due to thinner carcass and excellent adhesion, greater load carrying capacity, deeper and thicker treads, practically no carcass growth, and less tire weight.

NORTHERN CALIFORNIA GROUP HEARS TALK BY ROSS MORRIS

Approximately 50 members and guests attended the October Meeting of the Northern California Rubber Group, held on October 24 at Angelo's Restaurant in Oakland, Calif. The program featured an interesting talk on "Smooth Bore vs. Rough Bore Oil Hose," by Ross E. Morris, senior rubber technologist at the Mare Island Navy Yard, Mare Island, Calif.

The following conclusions were reached, according to Mr. Morris, as a result of exhaustive tests made at the Tide Water Associated Oil Co., Avon, Calif.:

First, and most important, at the same pressure drop, the 6-inch smooth bore hose carried approximately three times as much fuel oil as the 4-inch smooth bore hose, and the 6-inch rough bore hose carried approximately twice as much oil as the 4-inch rough bore hose. On the basis of cross sectional areas alone, we would expect the 6-inch to carry a little more than twice as much oil as the 4-inch.

Second, in most cases for the same pressure drop the horizontal hose carried a little more oil than the draped hose. This was to be expected because the bends due to draping must have caused some additional turbulence in the oil.

Third, the relation between pressure drop and flow rate was usually not dependent upon inlet pressure. That is, the same flow rates were usually obtained at inlet pressures 50, 110, and 150 psi if the pressure drop per unit length was held constant.

In conclusion, this comparison between rough bore and smooth bore hose were summarized as follows: In the case of the 4-inch hose, the rough bore tended to be somewhat stronger, but the smooth bore carried more oil, particularly when the oil was thin. In the case of the 6-inch hose, the rough bore was considerably stronger, but the smooth bore carried much more oil, up to 50% more.

A leather traveling kit, furnished as a door prize by the Goodyear Rubber Co., 2400 Third St., San Francisco, Calif., was won by L. L. Shafer, general manager of the American Rubber Manufacturing Co., 1145 Park Ave., Oakland, Calif.

Additional Navy Specifications

Two additional specifications on rubber have been issued by the Bureau of Ships of the Navy Department since our last report. Copies of these specifications may be secured by addressing a request to the Navy Department, Bureau of Supplies and Accounts, Washington 25, D. C. The specifications follow:

Navy Dept. Spec. 33H4h—Hose, Oil and Gasoline Suction and Discharge, Synthetic Rubber (Wire Stiffened), September 3, 1946.

Navy Dept. Spec. 52C40—Compound, Calking, Synthetic Rubber Base (For Seams of Wooden Decks), September 16, 1946.

OUTPUT OF PASSENGER TIRES INCREASES 17.61% IN AUGUST

Passenger car tire production by American manufacturers during August registered a sharp increase of 17.61% over July, climbing from 4,923,968 units to 5,790,850 units, according to the latest statistical report of the Rubber Manufacturers Association. Production for the first eight months of 1946 was estimated at 41,451,953 units, as compared with 14,457,768 units produced during the first eight months of the previous year.

Truck and bus tire production increased 19.01% in August, totaling 1,263,016 units, as compared with 1,061,266 units in July. The eight-month output of truck and bus tires this year amounted to 10,027,008 units, against 12,398,993 manufactured during the corresponding period of 1945. Total production of automotive pneumatic casings in August amounted to 7,053,866 units, an increase of 17.85% over the 5,985,234 produced during the previous month, while total output of casings for the first eight months totaled 51,478,943 units, as compared with 26,856,761 produced during the similar period of the previous year.

August production of passenger car, truck and bus tubes amounted to 7,032,135 units, an increase of 23.33% over the 5,701,851 units manufactured in July. Production of tubes for the first eight months of 1946 was estimated at 46,374,342 units, against 26,193,763 units produced during the first eight months of 1945.

Shipments of passenger car tires in August amounted to 5,493,075 units, an increase of 9.64% over the 5,010,131 units shipped in July, while inventories at the end of August increased 11.54%, from 2,051,732 units to 2,288,409. August shipments of truck and bus tires totaled 1,331,460 units, against 1,236,461 units shipped during the previous month, an increase of 7.68%, while inventories at the end of August amounted to 718,031 units, a decrease of 14.39% over the 838,737 units in inventory at the end of July.

Total August shipments of passenger car, truck and bus tires increased 9.25%, from 6,246,592 units to 6,824,535 units, while end-of-month inventories rose from 2,890,469 units to 3,006,440 units, an increase of 4.01%. Passenger car, truck and bus tube shipments in August totaled 6,930,537 units, an increase of 16.30% over the 5,959,194 units shipped in July, but inventories at the end of August decreased .64%, from 3,954,149 units to 3,928,912.

The Association's report shows that export markets had received 389,387 units during the first eight months of 1946, which is less than 1% of the 41,451,935 passenger car tires produced during that period. A total of 34,548,026 passenger car tires were shipped during the eight-month period as replacements, which is more than were channeled to replacement markets in any year since 1931. The automobile industry received 5,887,121 units for original equipment through August 31.

Collier Named Quality Director

Simon Collier

Simon Collier, who has been staff manager of the Inspection and Control Department of the Johns-Manville Corporation since August, 1936, has been promoted to Director of Quality of that company. The promotion followed a reorganization within the company under which it is now divided into six separate divisions, each representing some basic activity of the company. The rubber manufacturing activities, for example, are now the responsibility of the Industrial Products Division. Mr. Collier has been associated with the rubber field for some 30 years, ever since being graduated from the Worcester (Mass.) Polytechnic Institute. Prior to joining the Manville organization, he was associated with the Boston Belting Co. and the National Bureau of Standards. He was chief chemist of Manville's Waukegan, Ill., plant before being named manager of the Inspection and Control Department, with headquarters in New York. In addition to playing a prominent role in the activities of the New York Rubber Group, of which he is vice-chairman, Mr. Collier is also chairman of A.S.T.M. Committee D-11 on Rubber Products.

R.M.A. Wins National Award

The annual award of the American Trade Association Executives for distinguished service to industry and the American public at large was recently awarded to the Rubber Manufacturers Association. The basis of the award for 1946 was the development of a public relations program as part of the R.M.A.'s service to the rubber manufacturing industry, which was initiated by the Association in 1945 on the recommendation of its Board of Directors. The award was made after a review of the activities of 23 large national trade associations in various fields. F. K. Brasted is secretary of the R.M.A.'s public relations committee.

A.S.M.E. RUBBER DIVISION COMPLETES MEETING PROGRAM

The Annual Meeting of the Rubber & Plastics Division of the American Society of Mechanical Engineers will be held at the Hotel Pennsylvania in New York City on December 2 in conjunction with that of the parent society which will extend from December 2 to 6. As usual, the meeting of the Division will be divided into separate rubber and plastics sessions, with the rubber session to be held on the morning of December 2 and the plastics session on the evening of the same day, starting at 8:15 P.M.

Four papers are scheduled for delivery during the rubber session, as follows: *Practical Aspects of Design of Structural Rubber*, by E. E. Blaurock, U. S. Rubber Co., Detroit, Mich.; *Vibration Dampening with Rubber Mountings*, by Robert C. Lewis, Winchester, Mass., and Karl Unholtz, M-B Manufacturing Co., Inc., New Haven, Conn.; *Laboratory Testing of Rubber Torsion Springs*, by D. H. Cornell and J. R. Beatty, B. F. Goodrich Co., Akron; *Advances in Rubber During 1946*, by E. F. Riesing, Firestone Tire & Rubber Co., Detroit, Mich.

An equal number of papers will be presented during the plastics session, as follows: *Mechanical Precision in Molded Plastic Parts*, by S. K. Moxness, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.; *Chemical Resistance of Thermosetting Phenolic Laminates*, by Wallace Tyrie, General Electric Co., Lynn, Mass.; *Creep, Long Time Tensile, and Flexural Fatigue Properties of Melamine and Phenolic Plastic Materials*, by Dr. D. Telfair, Earlham College, Richmond, Ind., and H. W. Mohrman and C. H. Adams, Monsanto Chemical Co., Springfield, Mass.; *Advances in Plastics During 1946*, by Henry M. Richardson, DeBell & Richardson, Inc., Springfield, Mass.

Three Departments Merged

Three departments in the mechanical goods division of the Goodyear Tire & Rubber Co., Akron, have been merged as an initial step in an accelerated postwar expansion program. E. W. Sanders, manager of printers' supplies and industrial rolls, will head the new tank lining and rubber-covered roll section into which the printers' supply department has been integrated. R. W. Eckstein, now assistant manager of tank lining, becomes manager, while Ernest Peterson, assistant to Mr. Sanders, will assume duties as manager of the industrial roll department.

Ross Co. Moves Offices

Frank B. Ross Co., Inc., crude rubber broker, has moved its offices from Hoboken to 6 Ash St., Jersey City, N. J. The new telephone number is BErgen 3-4152. Frank B. Ross is president of the company.

AIR SPRING APPLICATION TEST CONDUCTED ON RAILROAD CARS

An experimental application of air springs to railroad passenger car trucks, which is expected to lead to revolutionary changes in railroad passenger car design and greatly increased passenger comfort, was tested recently by the Firestone Tire & Rubber Co. and the Pullman-Standard Car Manufacturing Co.

This innovation in railroad equipment, a Firestone development, was given its first public tryout in a special run over the tracks of the Chicago, South Shore and South Bend Railroad between Michigan City and Chicago. Used in the experiment was Pullman-Standard's special laboratory car, one end of which was equipped with Firestone air springs and the other with steel coil springs. Instruments, capable of checking the lightest variations in lateral sway and vertical motion caused by track irregularities, recorded the test which was made at speeds varying from 35 to 80 miles per hour.

The air spring has already been used on airplane landing gears and heavy truck trailers, passenger busses and on Bofors anti-aircraft gun carriers. It also has been tested on numerous passenger automobiles and found to be superior to conventional steel suspension systems. Expectations are that the air spring will do for railroad passenger cars what the balloon tire accomplished in the way of increased comfort for the automobile.

The air spring can be compared to an automobile tire lying on its side. Inflated, it is connected to an air reservoir which acts as both spring and shock absorber. When the tire-like bellows is deflated by reason of a wheel hitting a track irregularity, the bellows forces air into the reservoir. The rebound is then snubbed by a specially designed control valve between the bellows and the reservoir, thus minimizing the shock to the car passengers.

Experimental Air Spring Truck

This experimental air spring truck, like the steel spring truck commonly used, contains two sets of springs. The journal box springs, which receive the first impact from the rails, consist of two air springs at the end of each axle. Both springs are connected to a common air reservoir. The air springs are like a tire approximately 9 inches in diameter and 4 inches high. The other set of air springs is applied beneath each end of the truck bolster, the principal lateral member of the truck. These latter springs are about 20 inches in diameter and four inches high.

On Pullman-Standard's laboratory car the air springs are inflated from an outside compressor in the same manner as an automobile tire. Pressure varies from 75 to 100 pounds per square inch, dependent upon the load to be carried. It is expected that the air spring will be superior to the coil spring in durability as well as requiring less maintenance.

In a joint statement, Roy F. Johnson, engineer of research for Pullman-Standard, and Roy W. Brown, research engineer for Firestone, pointed out that the most recent trial run was the fourth made with air springs under a railway passenger car. The first was made at speeds not higher than 35 miles an hour, to prove in a preliminary way the safety of the device. The second run was made at speeds up to 55 miles an hour to check on various details of the application, and on the suitability of the recording instruments. The third run was made at speeds as high as 80 miles an hour.

According to the statement, the air spring is still in early stages of experimentation, and both companies are still seeking a comparison of its fundamental advantages over the steel coil springs now in ordinary use. This is expected to require many test runs over a period of several months and a variety of adjustments and corrections.

Non-Metallic Hot Air Duct

A non-metallic hot air duct for aircraft, which is said to weigh less than one-half as much as aluminum tubing and to convey air at temperatures up to 500° F., has been developed by the U. S. Rubber Co. Known as Multi-Flex, the new duct is made of glass fabric impregnated with heat-resistant rubber and plastics. It can be made rigid or flexible, ranging from one to six inches in diameter and up to eight feet in length. It is designed for use in the thermal heating system of airplanes.

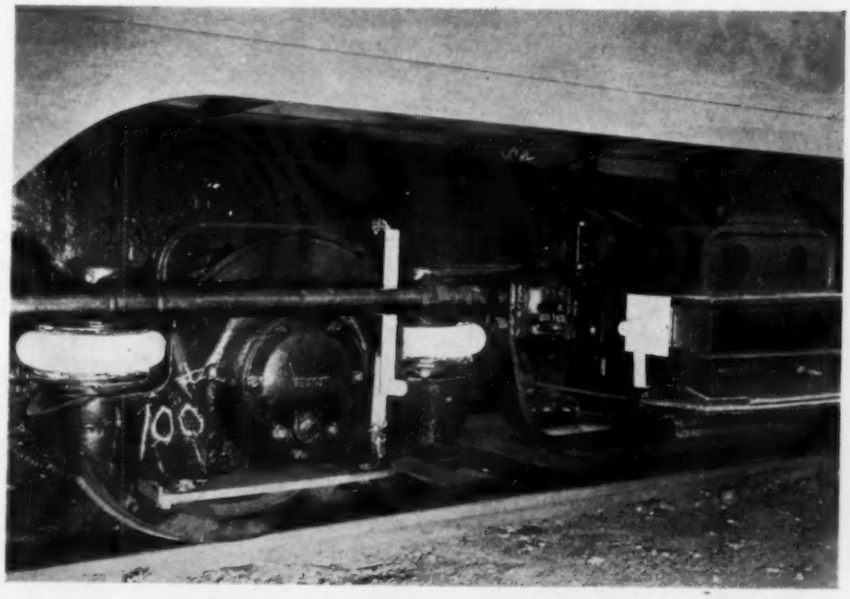
RUBBER FACILITIES BRANCH ESTABLISHED BY WAA GROUP

Establishment of a Rubber Plants and Facilities Branch to dispose of about sixty surplus plants producing raw materials, synthetic rubber, and end-products has been announced by the War Assets Administration. The new branch will be headed by R. F. Dimmitt and will dispose of more than $600,000,000 worth of rubber plants, most of which are still in operation under supervision of the Office of Rubber Reserve and have not yet been declared surplus.

In announcing establishment of the branch, WAA emphasized the importance of rubber to national defense. The Inter-Agency Policy Committee on Rubber, composed of representatives of all interested government agencies, recommended to Congress and the President that rubber facilities be disposed of to private industry, but with safeguards to assure continued manufacture and use of synthetic rubber.

WAA reported that all dispositions will be in accordance with the objectives of the Surplus Property Act which provides for wide distribution, encouragement of small business, and prevention of monopolistic activities. Another basic objective will be to transfer the plants from government to private ownership with little or no disruption of production and in a manner to serve the best interests of national economy.

The Rubber Plants and Facilities Branch will confer with and assist private industry in preliminary negotiations for plans and in determining degree of participation in the synthetic rubber program.



View of the air spring of the Firestone Tire & Rubber Co. mounted on a railroad passenger car truck. The white tire-like objects on either side of the journal box suspension are the bellows which are connected to a compressed air reservoir containing a specially constructed valve. This valve acts as a shock absorber and cushions the ride. The white square at the right is the scratch plate which recorded the vertical motion of the car in the test runs between Michigan City and Chicago.

NEWS IN BRIEF

Easthampton Rubber Thread Co., Easthampton, Mass., has received authorization from the Civilian Production Administration to construct $75,000 of additional facilities.

"Financing Small Business: Its Economic Position and Financial Requirements" is the title of a new booklet issued by the National Association of Manufacturers. It is an objective study of the financing problems of America's small enterprise and its place in the nation's business picture.

Dayton Rubber Manufacturing Co. has been awarded a bronze "Oscar of Industry" by *Financial World* for submitting the clearest and most comprehensive financial report to its stockholders in 1945.

H. O. Canfield Co. has opened a New York sales office at 444 Madison Ave., New York 20, N. Y., under the direction of E. R. Staley, general sales manager.

"Petroleum Discovery and Production," the second in a series of brochures, which are designed to describe the many operations of the petroleum industry, has been made available by the American Petroleum Institute, 50 West 50th Street, New York 20, N. Y.

The control of hazards resulting from the industrial use of sulfuric acid is outlined in the fourth of a series of pamphlets being issued by the Department of Labor, Washington 25, D. C., under the general title of "Controlling Chemical Hazards." The other three pamphlets issued so far in the series are on chlorine, ammonia, and formaldehyde, respectively.

Goodyear has announced that Pliofilm is now being used as a liner to retain the natural moisture and flavor of shrimp.

Gro-Cord Rubber Co., Lima, Ohio, has been reported preparing the first shipment of more than $100,000 worth of shoe-soling material for export to Byelo, Russia. The order calls for 50,000 of the 31-square inch rubber mats.

A new booklet, entitled "Surplus Property: How, What and Where," has been made available by the War Assets Administration as a handy guide for prospective purchasers of surplus property.

A Waldron cord treating unit has been installed at the Newark, Ohio, plant of the Pharis Tire & Rubber Co. at a cost of approximately $100,000.

A new 12-page booklet entitled "Physical Properties of Synthetic Organic Chemicals" has been issued by Carbide & Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y., as a condensed guide for research chemists, laboratory technicians, and purchasing agents.

Pliofilm, which was recently made available by Goodyear to the tobacco industry for wrapping the finished product, has been reported ideal for preservation of leaf and filler by several tobacco warehouses.

Farm tire specifications and truck tire construction data are featured in four new tire manuals which have been made available by U. S. Rubber.

Manhattan Rubber is again producing its A. B. C. Regulation Bowling Balls which were developed just prior to the war and the output of which was suspended as a war conservation measure.

The physical and chemical properties of ten commercially important ketones produced by Carbide & Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y., are discussed in a new booklet issued by the company.

Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y., has made available a Rod Selector Chart which presents the bonding and remelting temperatures, strength in psi, and applications of the company's products.

Cementex Co., Inc., 336 Canal St., New York 13, N. Y., has developed a new line of synthetic rubber latex compounds for the carpet industry. These compounds can be sprayed or brushed on and are vulcanizable.

A cold cabinet lid made entirely of rubber, which features a fabric-reinforced rubber hinge that does not require lubrication, has been introduced by Goodrich.

The story of completely automatic molding is told in a new color 16 mm. motion picture called "Robots at Work" which has been made available by the F. J. Stokes Machine Co., Tabor Road, Philadelphia 20, Penna., for showings to engineering and industrial groups. Running time of the film is 30 minutes and the narration is by Lowell Thomas.

Flintkote has announced that the name of its newly developed non-slip floor coating product, which was recently labeled Flintred, will be known instead as Flintdek.

"Retooling America," a booklet which outlines how manufacturers can acquire surplus war machine tools and at what price, has been made available by the War Assets Administration, Washington 25, D. C.

Lovejoy Flexible Coupling Co., Chicago, Ill., has acquired the mechanical power transmission department of Ideal Industries, Sycamore, Ill. The products that pass to Lovejoy are: Ideal variable speed pulleys, adjustable motor bases, "Select-O-Speed" transmissions, Ideal drive sheaves and stock of wide V-belts.

Firestone has issued a new manual, entitled "Off-the-Highway Tires for Lowest Operating Costs," which describes the construction of huge off-the-highway tires and gives complete information on care and inflation.

Plastic innersoles, made of vinylidene chloride, are now being produced by the Chicopee Manufacturing Co. for use in sports and industrial footwear. The innersoles are the same as those used for Army and Navy footwear during World War II.

A data book on battery applications for 1946 passenger cars has been made available by the Association of American Battery Manufacturers, Inc., 2706 First Central Tower, Akron 8, Ohio.

Hewitt-Robins, Inc., is now producing foam rubber cushions for the modern luxury cruisers built by the Richardson Boat Company, Inc., North Tonawanda, N. Y.

A paper twine coated with vinyl butyral, which can be used for weaving rugs, automobile upholstery and furniture slip covers, has been developed and is now being produced in limited quantities by the Worcester Plastic Coating Co., Worcester, Mass.

A Resinox phenolic resin has been developed by the Monsanto Chemical Co. which prevents the intrusion of natural gas into oil wells with what the company reports to be greater efficiency and economy than any material previously used.

Pantasote Corp. has introduced an innovation in the plastic fabric field with the establishment of a fashion bureau at 444 Madison Ave., New York 22, N. Y., to advise manufacturers on style trends and consumer potential for certain items made of Pantasote film and coated fabrics.

Two digest-sized manuals, *"The Foreman and the Veteran"* and *"What's Ahead for the Veteran,"* which give concrete suggestions on handling the various situations arising in foreman-veteran relations, have been made available by National Foremen's Institute, Inc., Deep River, Conn.

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NEW POLYMERS AUTHORIZED BY OFFICE OF RUBBER RESERVE, RECONSTRUCTION FINANCE CORPORATION

Listed below are types and properties of new experimental GR-S polymers (including GR-S latices) which have been authorized by the Office of Rubber Reserve, Reconstruction Finance Corporation, since publication of those listed in our last issue. Procedures for the distribution and sale of these polymers will be found in our October, 1945, issue.

X-Number Designation	*Manufacturing Plant*	*Date of Authorization*	*Polymer Description*	*Special Characteristics*
X-334-GR-S	General, Baytown	10/7/46	Masterbatch containing 50 parts Philblack and 100 parts of a GR-S type 10 polymer made at slightly higher temperature; Mooney viscosity 35 ± 5.	X-334, X-335, X-336 and X-337 are expected to show superior processing and handling characteristics due to the presence of carbon black.
X-335-GR-S	General, Baytown	10/7/46	25 parts Philblack and 100 parts of a GR-S type 10 polymer.	See above.
X-336-GR-S	General, Baytown	10/7/46	40 parts Furnex Black and 100 parts of a GR-S type 10 polymer.	See above.
X-337-GR-S	General, Baytown	10/7/46	50 parts EPC black and 100 parts of a GR-S type 10 polymer.	See above.
X-339-GR-S	Goodrich, Port Neches	10/1/46	Same as X-338 GR-S except that less rosin and soap is used.	For same purpose use as X-338.
X-340-GR-S	U. S. Rubber, Institute	10/11/46	Same as GR-S-25 except that a different shortstopper is used.	For same purpose use as GR-S-25.
X-342-GR-S Latex	Goodrich, Louisville	10/3/46	X-309 GR-S Latex with a higher water to monomer ratio.	A type II Latex with formulation especially developed for better tire cord adhesion.
X-343-GR-S	Firestone, Akron	10/11/46	A GR-S type polymer made with lower water-to-monomer ratio, carried to a lower than usual conversion. Shortstopped with hydroquinone and stabilized with PBNA.	
X-344-GR-S	U. S. Rubber, Institute	10/25/46	Same as X-285 GR-S except that a different shortstopper and 1.5 antioxidant will be used.	This material should show superior processing and low shrinkage characteristics.
X-345-GR-S	Firestone, Lake Charles	10/29/46	GR-S type 10 polymer made by continuous polymerization and coagulated with aluminum sulfate.	For same purpose use as GR-S-10.
			Reauthorizations have been issued for the following polymers which were previously authorized, made, and in consumers' tests found advantageous:	
X-250-GR-S	Goodrich, Louisville	10/25/46	Regular GR-S at 45 ± 5 Mooney. Shortstopped with hydroquinone. No antioxidant.	General purpose use.
X-274-GR-S	National Synthetic, Louisville	10/23/46	GR-S 10 shortstopped with sodium sulfide and stabilized with Stalite.	For same purpose use as GR-S 10. Produced for materials where a special non-discoloring anti-oxidant is required.
X-278-GR-S	U. S. Rubber, Naugatuck	10/23/46	50/50 Bd/styrene ratio polymer made using sodium and glue emulsifiers, shortstopped with hydroquinone, 2 parts PBNA antioxidant, alum coagulated.	For use in closure and sealant compounds.
X-285-GR-S	U. S. Rubber, Naugatuck	10/25/46	Bd/styrene polymer with an auxiliary chemical to produce high gel content in the polymer, shortstopped with hydroquinone and stabilized with 1.5 parts B-l-e; salt acid flocculated; 60 Mooney viscosity.	This material should show superior processing and very low shrinkage characteristics. For use in footwear stocks, wire insulation, extruded mechanical goods and other types of products where these characteristics are desired.
X-317-GR-S	U. S. Rubber, Institute	10/22/46	GR-S 20 AC made with a non-staining shortstopping agent using 1.5 parts EFED as stabilizer.	For use in goods where a non-staining antioxidant is desired.
X-315-GR-S	U. S. Rubber, Institute	10/22/46	Masterbatch containing 50 parts Silene EF and 100 parts of a 40 Mooney rubber, stabilized with 1.5 EFED.	For use in industrial products and specialties where this type of polymer is desired.

NAMES IN THE NEWS

C. H. HEDENBERG, who has had twelve years' experience in the rubber industry in Sweden, has been named operations manager of Goodrich Svenska Gummi, Aktiebolag, Stockholm, Sweden, a subsidiary of the International B. F. Goodrich Co.

HARRY A. TRISHMAN, formerly chief engineer of the Adamson United Co., Akron, has been appointed manager of the hydraulic division of the Erie Foundry Co., Erie, Penna.

HOMER E. LUDWICK, controller at the Los Angeles plant of the Firestone Tire & Rubber Co., has been elected a vice-president of the Controllers Institute of America.

ROLAND H. GRAY, resident manager of the Goodyear Engineering Corp., operators of the Hoosier Ordnance Powder Bag Loading plant at Charlestown, Indiana, during the war years, and S. A. STEERE, manager of the cotton and fabric production departments of the Goodyear Tire & Rubber Co., have been appointed vice-presidents of the Goodyear Clearwater Mills and the Goodyear Decatur Mills.

WILLIAM BUTCHER, superintendent of the Trenton, N. J., shops of L. Albert & Son, manufacturers and dealers of new and used rubber and plastic equipment, has been transferred to the Los Angeles plant, where he will act as general manager.

JOSEPH E. COX, who has been assistant general manager of the Windsor, Vermont, plant of the Goodyear Tire & Rubber Co. for the past few years, has been appointed vice-president and a director of the Essex Rubber Co., Trenton, N. J.

WILLIAM E. VECSEY, manager of the Aldora Mills at Barnesville, Georgia, textile division of the General Tire & Rubber Co., has been named to direct all of the textile developments of the parent company. He will maintain headquarters at Akron.

COLGATE W. DARDEN, JR., Chancellor of the College of William and Mary, Williamsburg, Va., has been elected a director of the U. S. Rubber Co., succeeding LAMMOT DU PONT COPELAND, recently resigned.

C. R. CASE, off-the-road tire design manager of the Goodyear Tire & Rubber Co., was recently presented with a citation from Army Ordnance for outstanding engineering service rendered during the war years.

ROBERT F. OHMER, recently discharged from the Army with the rank of colonel and previously president of the Commonwealth Engineering Company of Ohio, a firm specializing in industrial research and development, has been appointed vice-president in charge of administration by the Hydraulic Press Manufacturing Co., Mount Gilead, Ohio.

EDWARD B. BUTLER, who has been associated with the sales organization of General Tire & Rubber Co. for the past two years, most recently as director of dealer relations and sales promotion for the central division, has been appointed director of public relations by the company.

HARVEY S. FIRESTONE, JR., president of the Firestone Tire & Rubber Co., recently received a Navy Certificate of Achievement for his company "in grateful recognition of outstanding service to Naval personnel during World War II."

JAMES E. STEVENSON, who has been New York district sales manager of the L. H. Gilmer Co., a division of the U. S. Rubber Co., for the past seven years, has been named manager of V-belt sales for the U. S. Rubber Co.

SAMUEL W. KOFFLER, recently discharged from the service with the rank of lieutenant, has joined the Loewenthal Company, scrap rubber dealers of Chicago, Ill. He is a nephew of Jack Sider, president of the company.

CALVIN S. FULLER, research chemist of the Bell Telephone Laboratories, Murray Hill, N. J., well-known in the field of organic high polymers, has been proposed for nomination as a councilor-at-large for 1947 of the American Chemical Society.

WARNER W. BAYLEY, recently retired from the U. S. Navy with the rank of commander, has joined Sidney Blumenthal & Co., 1 Park Ave., New York 16, N. Y., as research director.

DR. C. C. CRAWFORD, formerly manager of the products development division of Phillips Petroleum Co., Bartlesville, Okla., has been appointed assistant manager of the chemical products department in charge of the special products, product development, and Perco divisions.

CLIFF SLUSSER, who joined the Goodyear Tire & Rubber Co. in 1911 as a teen-age clerk and in 15 years became vice-president in charge of production, completed 35 years of service with the company in October.

Clarke Joins Dayton Rubber

M. H. Clarke

M. H. Clarke, formerly president of the Lake Shore Tire & Rubber Co., Des Moines, Iowa, has been appointed vice-president and director of manufacturing of the Dayton Rubber Manufacturing Co., Dayton, Ohio. Mr. Clarke will be in charge of the engineering, production, laboratory, traffic, safety, and plant protection divisions in all of the company's operations. A graduate of the Georgia School of Technology, Mr. Clarke has spent many years in engineering and manufacturing activities and is well known in rubber industry circles.

DR. TRAVIS W. BRASFIELD, recently discharged from the Army with the rank of lieutenant colonel, and previously head of the biology department of Perkinston Junior College in Perkinston, Miss., has been appointed sales manager for agricultural chemicals by the U. S. Rubber Co.

B. A. EVANS, who has been associated with the metal products division of the B. F. Goodrich Co., Akron, and R. J. KELLER, associated with the company since 1933, have been named manager and technical manager, respectively, of the company's wheel and brake manufacturing department at Troy, Ohio.

A. S. VANMARTER, associated with the laboratory staff of the Essex Rubber Co., Trenton, N. J., for some time, has been made director of development of the company.

FRED C. ZIESENHEIM, associated with a prominent manufacturer of plastics molding and die casting machines as sales and advertising manager for the past six years, has been appointed sales manager of the Plastics and Die Casting Machinery Divisions of the Hydraulic Press Manufacturing Co., Mount Gilead, Ohio.

CONFERENCE OF TIRE DEALERS FEATURES PAPERS ON RUBBER

The twenty-sixth annual conference of the National Association of Independent Tire Dealers, held at the Hotel Biltmore in Los Angeles, Calif., from October 14 to 16, featured several technical papers intended to acquaint tire dealers with the latest technological developments in the rubber industry.

These developments were outlined in papers presented by Dr. John Street, of the Firestone Tire & Rubber Co. and the present director of research and development of the Office of Rubber Reserve; V. L. Smithers, head of the V. L. Smithers Laboratories, Akron; Mason DuPree, Jr., special assistant to the director of the Southern Regional Research Laboratory of the U. S. Department of Agriculture, New Orleans, La., and William Luttge, sales manager, Viscose Yarn Division, American Viscose Corp., New York City.

In a talk on "Rubber—Synthetic and Natural," Dr. Street indicated that appreciably more natural rubber would be available for products in 1947 than was used in 1946. He estimated that the ratio of natural to synthetic rubber would be allowed an average increase in 1947 to approximately 50% natural to 50% synthetic, and that by late 1947 this ratio would be raised to about two to one.

Discussing "Rubber—Yesterday, Today, Tomorrow," Mr. Smithers reviewed the history of rubber, from the discovery of vulcanization by Goodyear to the introduction and development of dielectric heating in the rubber industry. He also touched on the transplanting of 60,000 seeds of *Hevea brasiliensis* from Brazil to the Kew Botanical Gardens in England, and the discovery of organic accelerators.

Mr. DuPree, in a paper on "Cotton Tire Cord—Present and Future Use in Tires," declared that most of the advantages claimed for rayon arise from the fact that present types of rayon cord are stronger than present types of commercial cotton cord, on both a diameter and a weight basis. In making an appraisal of the relative value of cotton and other fibers for use in tires, the speaker stressed two facts: (1) that better cords than those which are being commercially produced today can be produced by using higher quality cottons; and (2) the differences between the physical properties of different types of cord are of varying importance in different classes of tire service.

In a talk on "Characteristics of Rayon and Its Uses in Tires," Mr. Luttge pointed out that in heavy-duty tires rayon has become the standard cord. He emphasized that this does not mean that no cotton whatever is being used, but that the tire industry is gearing itself toward making all heavy-duty tires with rayon. At present, the supply situation was said to permit only about 70% of current production of large size tires to be made with rayon cord. Covering the production of rayon cord for the tire industry, the speaker reported that it rose from 28,000,000 pounds in 1943 to 130,000,000 pounds in 1945. He estimated consumption for 1946 at 205,000,000 pounds, which is more than 50% higher than last year and which represents about 75% of the rubber industry's demand in 1940.

Soap in Rubber

Seven percent of the nation's soap goes into the production of synthetic rubber, according to a recent statement by Dr. Waldo L. Semon, director of pioneering research of the B. F. Goodrich Co. Consumption of soap used for the coagulation of synthetic rubber in the production stage will amount to 125,000,000 pounds in 1946, according to Dr. Semon, who also pointed out that the fatty acid derived from the soap comprises approximately 6 percent of the rubber.

Postpones Expansion Project

Seiberling Rubber Co., Akron, has postponed its projected $4,000,000 expansion project at Garland, Tex., because of labor and material shortages, high construction and alteration costs, and "the certainty of extensive delays" in procuring necessary equipment. The company had been planning to convert a former Continental Motors war plant at Garland into a tire and tube factory. The company plans to continue the project as soon as conditions become more favorable.

DuPont Technical Bulletins

Three new technical bulletins have recently been made available by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. Titles of the bulletins are: *Neoprene Industrial Solid Tires* (BL-213), *The Preparation of Dispersions and Emulsions with Glue as the Protective Colloid* (BL-214), and *Neoprene Latices Types 842 and 601* (BL-217).

DOMESTIC RUBBER CONSUMPTION INCREASES 15.10% IN AUGUST

During the month of August, the consumption of natural and synthetic rubber in the United States amounted to 88,122 long tons, an increase of 15.10% over the 76,560 long tons consumed during June, according to a report issued by the Rubber Manufacturers Association. For the eight months from January 1, 1946, rubber manufacturers consumed 658,700 long tons of both natural and synthetic rubber, as compared with 553,759 tons used in the corresponding period of 1945, th last eight months of the war.

Natural rubber consumption increased 28.82% in August, totaling 28,338 long tons, as compared with 21,998 tons in July. Consumption of natural rubber for the first eight months of this year amounted to 134,861 tons, against 76,664 tons consumed during the same period in 1945, an increase of 75.91%.

August consumption of synthetic rubber totaled 59,784 long tons, an increase of 9.57% over the 54,562 tons consumed during the previous month. From January 1, 1946, to August 31, 1946, 523,839 tons of synthetic rubber were consumed, an increase of 9.80% over the 477,095 tons consumed during the same period of 1945. During August, synthetic rubber was consumed in the following proportions: 48,568 tons of GR-S; 3,875 tons of neoprene; 6,788 tons of Butyl; and 553 tons of nitrile rubber.

Consumption of reclaimed rubber in August increased 13.56% over July, rising from 21,350 tons to 24,246 tons, while consumption for the first eight months of 1946 amounted to 176,687 tons, as compared with 161,633 tons consumed during the corresponding period of the previous year, an increase of 9.31%.

Converse Subsidiary Formed

Granite State Rubber Co., Berlin, N. H., has been organized as a wholly-owned subsidiary of the Converse Rubber Co., Malden 48, Mass., for the purpose of producing tops for canvas footwear for the parent company. No processing of rubber will be carried on by the new company, officers of which include Spencer Cowan, president; Joseph H. Shriber, vice-president, and David G. Stone, treasurer. John O'Neil is factory manager.

COMPARISON OF 1945 AND 1944 TIRE COMPANY REPORTS

	Sales		Profits	
	1945	1944	1945	1944
Armstrong	$ 10,683,258	$ 6,805,669	$ 299,339	$ 505,629
Firestone	681,744,072	651,410,411	16,446,735	16,310,845
General	87,095,110	73,838,570	1,607,543	2,198,569
Goodrich	372,082,813	419,294,119	12,313,501	12,015,842
Goodyear	716,176,748	786,722,287	15,136,816	15,204,270
Mohawk	7,857,399	6,715,016	343,970	361,118
Norwalk	8,827,507	6,359,590	223,052	155,142
Seiberling	26,288,523	22,904,820	504,882	510,145
U. S. Rubber	471,506,473	443,077,453	13,024,778	15,832,613

LOS ANGELES NEWS

The first regularly scheduled Pacific Chemical Exposition, featuring an industrial chemical conference and display for the western states and Pacific area, will be presented in the Civic Auditorium in San Francisco, October 21 to 25, 1947, by the California Section of the American Chemical Society. Chairman for the Exposition is Paul H. Williams, of the Shell Development Company, and the manager is Marcus W. Hinson, who has handled the National Chemical Exposition for the Chicago Section since 1940.

The natural resources of the west, plus those around the rim of the Pacific Ocean, offer opportunities for exploitation that stagger the imagination. The Pacific Chemical Exposition will be a showcase for a quick view of the unlimited opportunities of the whole Pacific area.

With general recognition that every manufacturing process involves chemistry in some way, western industry will now have equal opportunity, through the Pacific Chemical Exposition, to get its production problems solved quickly and with a perfection that comes only through the personal contact afforded by such an Exposition.

A newly-formed central manufacturing district, in which the Converse Rubber Co. of Malden, Mass., will soon erect a $1,125,000 Pacific Coast plant, was recently dedicated at San Bernardino.

Ira Mosher, chairman of the board of directors of the National Association of Manufacturers, and one of industry's leading spokesmen for industrial stabilization, was the principal speaker at the dedication. Mosher addressed the gathering on the subject of "New Horizons for America."

Patterned after model industrial areas in Los Angeles and Chicago, the San Bernardino manufacturing district covers a 700-acre plot on the northwest rim of the city. In addition to Converse, which expects to start work on its plant in 1947, several other nationally-known manufacturers are interested in establishing plants in this district.

A dinner for the manufacturing district bond holders, as well as city and county officials, was held in the evening at Arrowhead Springs Hotel.

Roylyn, Inc., manufacturers of quick couplings, fuel caps and strainers, has moved to larger quarters at 718 West Wilson Ave., Glendale 3, Calif. The new facilities are expected to result in better and more prompt service to the trade.

William Jeffers and C. M. Reinke are shown examining the scroll, which was presented to the former in appreciation for his war job as rubber chief, at a recent meeting of the Los Angeles Rubber Group.

Robert A. Lees

who was recently appointed manager of the American Anode, Inc., plant being constructed in Los Angeles.

Monsanto ONB Plasticizer

A new plasticizer, designated as ONB (ortho-nitrobiphenyl), with a wide range of compatibility has been introduced by the Monsanto Chemical Co., 1700 South Second St., St. Louis 4, Mo. According to the manufacturer, ONB can be used alone or with other plasticizers. It is said to be applicable to the entire range of synthetic resins, from the cellulose esters through the vinyls and vinyl copolymers, and to be compatible as well with alkyd resins and some synthetic rubbers. The new plasticizer has a molecular weight of 199.20 and weighs approximately 9.9 pounds per gallon. ONB is reported practically insoluble in either hot or cold water, but readily soluble in benzene, alcohol, turpentine, mineral spirits, ether, acetone, and many other solvents.

Rayon Tire Yarn Plant

Contracts for engineering and construction of a new rayon tire plant, to be located at Lowland, Tenn., have been awarded by the American Enka Corporation to the H. K. Ferguson Co. The plant will consist of a complete new production unit. Approval of the project has been granted by CPA and construction at the plant site is expected to start immediately.

Osborn Buys Hardester Assets

C. J. Osborn Co. has acquired the physical assets of the Hardester Corp. at Linden, N. J., adjacent to its present resin plant. The Osborn company plans to enlarge its facilities for production of various types of resins and dispersed pigments.

To Deal in Natural Rubber

Stein, Hall & Co., Inc., 285 Madison Ave., New York 17, N. Y., importer, manufacturer, and distributor of industrial commodities, has announced that it will import and distribute natural rubber when the government returns it to regular industrial channels. The company's Rubber Department will be under the management of Donald V. Brandon, who has had many years experience with this commodity and is well known in the trade. Stein, Hall has been in business since 1866, and is well and favorably known as a prominent importer of tapioca flour, burlap, sisal, palm oil, tea, natural gums and other commodities. It is a distributor of these as well as other domestic products, which it either manufactures in its various plants or obtains from suppliers. The company maintains head offices in New York City with branches in fourteen strategically located cities staffed with salesmen who serve the surrounding territory. Canadian sales are made through Stein, Hall, Ltd., Toronto, Canada, which has a branch office in Montreal. Another subsidiary corporation, N. V. The Hall Trading Corporation "Rotterdam," Rotterdam, Holland, has branch offices in Batavia and Sourabaya, Java.

To Triple Wheel Production

U. S. Rubber Co. has announced that plans are being made to triple its production of high-speed grinding wheels used by steel mills, foundries, and metal fabricating plants. Increased production facilities will be established in a new plant in Ft. Wayne, Ind., recently acquired by the company from the government. Other products to be made in Ft. Wayne will include rubber parts for automobiles, such as steering wheels, engine mountings and rubber extrusions, industrial adhesives, rubber-covered rolls, rubber-lined tanks and pipes, and vibration absorption devices.

Acquires Combed Yarn Plant

The combed yarn plant of Ruby Cotton Mills, Inc., in Gastonia, N. C., has been purchased by the U. S. Rubber Co., in a move to further diversify its production of textile products. The plant, which employs 300 persons and has 19,000 spindles, will continue to operate under the present management, with Dan Maddox in charge as superintendent. Production of 20's and 50's combed yarn will continue without interruption. The purchase price was $1,300,000 for the buildings, equipment and land plus an additional sum to be determined by audit for raw materials and other assets.

Calcium Carbonate Moves Office

The Calcium Carbonate Co., suppliers of natural whitings to the rubber and other industries, featuring rounded particle and amorphous chalk structures, has moved its offices from 36 East Ohio St. to 222 West Adams St., Chicago 6, Ill.

Goodyear Builds Mammoth Tires

Goodyear Tire & Rubber Co., Akron, has added a 27.00-33 earthmover casing, which is said to be the largest truck tire ever built in the 48-year history of the company, to its regular sales line.

The new tire weighs 1,482 pounds and has a 24-ply rating rayon. Designed to handle unusually heavy off-the-road hauling requirements, the tire has a load rating of 31,050 pounds at 40 pounds inflation at 10 miles per hour. At 25 miles per hour it has a load rating of 27,600 pounds, also at 40 pounds inflation. The tire is being manufactured in the All-Weather and Sure Grip tread designs. The All-Weather is for both trailing and driving earthmoving operations, while the primary purpose of the Sure-Grip is to deliver super traction for driving wheels. The tire fits a 5° taper rim with sufficient compression under the bead to prevent slippage at low air pressure.

Establish New York Office

Scott Bader & Co., Ltd., of Wollaston, Northants, England, manufacturers of synthetic resins, and GR-S, reclaimed rubber, and plastic emulsions, have established a branch office in New York City under the name of Scott Bader & Co., Inc. The new office is located in the Graybar Building, 420 Lexington Ave., New York 17, N. Y., and the telephone number is LExington 2-9628. E. J. Luster, formerly head of the American Catalin Corporation and of Catalin, Ltd., is president of Scott Bader & Co., Inc.

Moves Offices and Plant

Transcontinental Rubber Corp. has moved its offices and plant to larger quarters at 601 West 26th St., New York 1, N. Y. The new telephone number is BRyant 9-8461. Justin Loewengart is president and general manager of the company which manufactures bathing shoes, rubbers, and toe rubbers.

Drop Dispersions Process, Inc.

Naugatuck Chemical Division of United States Rubber Co. has announced that the firm of Dispersions Process, Inc., no longer exists under that title and in the future all matters pertaining to Dispersions Process, Inc., should be referred to Naugatuck Chemical, Naugatuck, Conn. All shipments of Dispersite will henceforth be invoiced from Naugatuck Chemical. In addition, it was announced that sales headquarters for Naugatuck Colloids, including latex, Lotol and Dispersite, have been transferred from New York City to Naugatuck, Conn., and hereafter all inquiries should be directed to Naugatuck for prompt handling. As before, branch offices are being maintained in Boston, Akron and Detroit. Acquisition of the outstanding common stock of Dispersions Process, Inc., by U. S. Rubber Co. was announced last month. On October 14th the Flintkote Co. announced that it had sold its interest in Dispersions Process, Inc., to U. S. Rubber.

Goodrich Promotes Gaertner

Herman V. Gaertner, assistant treasurer of the B. F. Goodrich Co., Akron, has been elected controller of the company, to succeed T. B. Tomkinson, who will retire on December 31. Mr. Gaertner, who was appointed assistant controller in 1929 and assistant treasurer in 1943, joined Goodrich in 1916 as a clerk in the company's accounting division following his graduation from the University of Wisconsin. He was born in Madison, Wisconsin. In 1925 he was placed in charge of the company's traveling auditors and named budget supervisor. The following year he became assistant auditor moving to the position of assistant controller three years later.

To Expand Gadsden Plant

A $650,000 expansion program has been announced by the Goodyear Tire & Rubber Co. for its new sole and heel factory in Gadsden, Ala. The additional manufacturing facilities are expected to double the output of the plant, which was completed last fall at a cost of approximately $750,000. Approximately 200 persons are now employed at the plant. Products manufactured there include the company's new Neolite sole and heel line, as well as rubber heels and composition soles for dress, work, and sport shoes.

To Close Louisville Unit

According to a statement made on November 4th by George Field, manager of the plant, the B. F. Goodrich Co. will close its GR-S synthetic rubber unit at Louisville, Kentucky, at the end of the year, resulting in the dismissal of between 300 and 400 employees. Goodrich Chemical recently purchased the plant from the government and intends utilizing it for the expanded manufacture of Geon.

CANADIAN NEWS

The last of the strikes which tied up ten Ontario rubber manufacturing plants, employing more than 10,000 workers, for most of the summer was settled in Kitchener, Ont., on October 29 with the announcement that workers have ratified an agreement between the United Rubber Workers of America (CIO) and the Merchants Plant of the Dominion Rubber Co. Workers walked out on June 23 of all Ontario rubber plants, with the exception of the Kaufman Rubber plant, in a general demand for a 20-cent an hour wage increase and a 40-hour week. Most of the settlements, which came in a rush during the last two weeks in October, were on the basis of a 13-cent an hour increase.

The first break in the strike stalemate came on October 16 with the settlement of the 114-day-old strike at the Kitchener tire plant of the Dominion Rubber Co. This settlement was followed rapidly by agreements with all of the other rubber manufacturing companies in Ontario. Other plants which were affected by the June walkout are as follows: the Oakville plant of Barringham Rubber; the Montreal plant of Dominion Rubber; the Kitchener plant of Goodrich; the Hamilton plant of Firestone; the Bowmanville and New Toronto plants of Goodyear; and the Toronto plants of Gutta Percha Rubber, Seiberling Rubber, Dunlop Tire, and Viceroy Manufacturing Co.

C. D. Howe, Minister of Reconstruction, announced on November 1 that the price of GR-S and Butyl produced by the government-owned Polymer Corp., Sarnia, Ont., has been reduced from 20.35c a pound to 18.5c a pound. This was the seventh price reduction effected by the Polymer Company, the price of the original batch of commercial GR-S sold in October, 1943, having been 39.96c a pound. GR-S has been selling for 20.35c a pound during the last nine months.

According to a report in a recent issue of *Foreign Commerce Weekly*, a publication of the U. S. Department of Commerce, Canadian imports of crude rubber and manufactured rubber goods were valued at $7,020,069 in the first six months of 1946, representing a decrease of nearly $2,000,000 from the value of $8,995,319 for such goods imported in the first six months of 1945. Exports of rubber and rubber products amounted to $11,325,747 in the first half of 1946, which is a decrease of slightly more than $7,000,000 from the $18,386,760 value of such goods exported in the first half of the previous year.

One of the chief decreases was reported in crude rubber. Imports declined about $3,000,000 to $1,751,516 in the January to June period of 1946 from $4,718,127 in the like period of 1945. Exports of rubber, principally synthetic rubber, decreased by more than $2,000,000 in the comparative periods to $1,935,085 this year from $4,328,142 last year.

Exports of tire casings in the first six months of 1946 amounted to $4,160,063, as compared with $8,514,035 in the like period of last year. Imports of tire casings showed a gain, however, of more than $74,000, reaching $100,979 in the first half of 1946, as compared with $27,048 in the first half of 1945. Other gains and losses were described as moderate and diversified over about thirty items in the import trade and approximately fifteen items in the export trade.

The Canadian Rubber Control Board has announced a reduction in the price of natural rubber to Canadian manufacturers from 24.91c to 22.63c a pound. Government sources said the cut was made possible by the fact that the United States Government recently purchased 200,000 tons of rubber from Malaya at about 20.25c a pound. Shipping and other charges bring the price up to 22.63c in Canada.

The St. Jerome, Quebec, footwear plant of the Dominion Rubber Co. was awarded first place trophy in the International Safety Contest, Rubber Section, Group "A," at the convention of the National Safety Council in Chicago, Ill., on October 10. With more than 1,800 employees, the St. Jerome footwear plant rated zero severity and zero frequency in the contest in which rubber plants from all over the United States and Canada participated. At the end of August, this factory had piled up 5,122,181 man hours free of lost time injuries. In addition, the Province of Quebec Safety League announced the award of the Department of Labor Safety Trophy for 1945-46 to the same plant. J. Ernest Vanier is safety supervisor at the St. Jerome plant.

Lacrinoid Products, Ltd., recently organized, has started producing plastic goods for the domestic and export market at its plant at Buckingham, Quebec. The plant has 30,000 square feet of floor area and employs 150 persons. The company will produce door handles, furniture handles and trimmings, and other household articles.

Dunlop Tire & Rubber Goods Co., Ltd., has declared a dividend of 2½% on its 5% cumulative redeemable first preference shares for the half year ending December 31, 1946, to shareholders on record as of December 16.

Canadian manufacturers of rubber products revealed recently that they had received no official notification that an upward revision of natural rubber allocations to manufacturers may be made during the last two months of this year. They indicated, however, that they would not be surprised if natural rubber should become more available in the near future. Such an improved allocation is expected to result in an increased natural rubber content in tires.

Commenting on a report made by W. James Sears, director of the CPA Rubber Bureau, regarding an upward revision of natural rubber allocations, W. A. Hopton, vice-president and general manager of the Kitchener tire plant of the Dominion Rubber Co., stated that generally speaking Canada has been following the United States rubber content specifications, although the Canadian situation is somewhat different from that of the United States. He added, however, that if an upward revision does take place across the border, chances are that Canada will follow the same pattern.

Seiberling Rubber Co. of Canada has announced the appointment of Arthur P. Acheson to the newly-created post of assistant sales manager and Ian A. Butzer to succeed Mr. Acheson as the company's Toronto branch manager.

A goal of 118,000,000 pounds of synthetic rubber has been set by the Polymer Corp. for the year ending September 29, 1947. This represents an increase of 11,000,000 pounds, or 10.3%, over the 107,000,000 pounds produced during the year ending September 29, 1946. On September 29, 1943, the plant produced its first commercial batch of synthetic rubber. In the first year of operation about 60,000,000 pounds were produced, and in the second year about 102,000,000 pounds, with a 107,000,000-pound output in the third year. Of the grand total of 269,000,000 pounds produced, 222,000,000 pounds was GR-S and 47,000,000 pounds Butyl. In addition, the plant turned out 32,000,000 pounds of cumene and 8,500,000 pounds of ethylbenzene during the war years, plus 2,300,000 pounds of toluene. The plant has also produced 5,000,000 pounds of styrene in excess of its requirements for making GR-S. During the coming year, the styrene production at the plant will be increased to supply 12,000,000 pounds to the Dow Chemical Co. and the Monsanto Chemical Co., under contracts announced earlier this year.

With a view to future expansion, Polymer Corp. has announced that it is negotiating for the purchase of two large blocks of property in the vicinity of its Sarnia, Ont., plant. At the same time, the company denied rumors that it was working on plans for an early $10,000,000 addition to the rubber plant.

May Revive Guayule Project

According to a report in the *Akron Beacon Journal* of October 19, there is a strong possibility that the guayule project in California, abandoned by the government some time ago, may shortly be revived under sponsorship of the Army-Navy Munitions Board, with funds for continued development and harvesting being supplied by the Navy. Negotiations for the land were said to be current, with preliminary work proceeding very quietly. When the War Production Board ordered abandonment of the $40,000,000 project, it recommended that limited acreage be kept in cultivation on an experimental basis. The Department of Agriculture subsequently sought funds to carry out this proposal, but after the Senate approved such funds the Appropriations Committee of the House stymied the approval and recommended immediate liquidation. A good deal of the acreage has already been plowed under and the land converted to raising potatoes and other crops. The $450,000 guayule mill at Bakersfield was recently turned over to the War Assets Administration to be disposed of as surplus.

Adipol-BCA Plasticizer

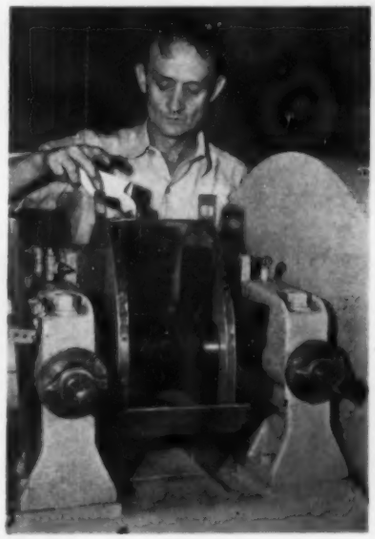
A new plasticizer, known as Adipol-BCA, has been developed by Ohio-Apex, Inc., Nitro, W. Va., for use in polyvinyl chloride, polyvinyl butyral, and copolymer type resins. The plasticizer is said to be insoluble or to have limited solubility in mineral oil, glycerine, the ethylene glycols, propylene glycol and some amines, while being soluble in most other organic liquids. The company claims that polyvinyl chloride, polyvinyl butyral, and copolymer resin films plasticized with this new material readily pass the ASTM bend-break test at —70° F. Other properties of the plasticizer include a freezing point of —30° C., flash point of 188°C., fire point of 227° C., volatility of 1.4% after 24 hours at 105° C., and viscosity of 12.5 centipoises at 20° C.

May Enter Plastics Field

An indication that the Faultless Rubber Co., Ashland, Ohio, may soon enter the plastics field was shown recently in the announcement that stockholders, at the annual meeting, had voted that change in the articles of incorporation. The stockholders also have authorized the company to increase its common stock from 100,000 shares of no-par value to 150,000 shares of $1 par value. An increase in the number of shares outstanding from 65,450 to 130,900 was also approved, giving each shareholder two shares of new stock for each share of the old common held. At the same meeting, T. W. Miller, Jr., was elected first vice-president.

Hood for Laboratory Mill

A simple hood, designed in the laboratories of the B. F. Goodrich Co. at Akron for a 4x7-inch mill to prevent fluffy pigments from flying around the room and to prevent loss of bits of rubber when extremely tough polymers are being



milled, is illustrated herewith. The side panels of the hood are made from 16-gauge sheet metal cut to fit around the mill guides and rolls. The center section is made from transparent cellulose acetate of 1/16th-inch thickness. This section is built into one side and directed so that pigment drops into the bank. The hood rests on the mill guides and clears the pan by about ¼ inch, so that pigment dropping into the pan can be collected on a sheet of paper and withdrawn and fed to the batch through the sprout without moving the hood.

Lake Shore Promotes Gunther

R. C. Gunther, vice-president of the Lake Shore Tire & Rubber Co., Des Moines, Iowa, has been elected executive vice-president of the company. Mr. Gunther has been connected with the rubber industry for over thirty years. Prior to joining Lake Shore, he was general manager of the Armstrong Rubber Co., West Haven, Conn., president of the Inland Rubber Corp., Chicago, Ill., and factory manager of the Mohawk Rubber Co., Akron.

Dedicate Carothers Laboratory

The nylon research laboratory at the Wilmington, Del., experimental station of E. I. du Pont de Nemours & Co. has been dedicated as the "Carothers Research Laboratory," in honor of the late Wallace H. Carothers, who headed the team of scientists that first synthesized nylon. Mr. Carothers is also given credit for much of the research which led to the development of neoprene.

Estimates Replacement Sales

Guy Gundaker, Jr., field sales manager of the B. F. Goodrich Co., asserted recently in an interview in Akron that production of passenger car tires for replacement sales alone will run between 53,000,000 and 54,000,000 units for 1946 at a "conservative estimate." This, he pointed out, is approximately equal to two tires for every automobile on the road today. By comparison, replacement sales in 1941 were 38,000,000, and in prewar years averaged 30,000,000 units. Because war-deferred demand for replacements, which is even more exceptional than the production rates, is still unsatisfied, he said, the customary seasonal drop in replacement sales is not expected this fall. But obviously the country cannot continue to absorb a 53,000,000-units-a-year replacement rate for very long, so that type of demand should ease off in a few months, Mr. Gundaker declared. The Goodrich executive indicated, however, that increasing demand for original equipment tires would in considerable degree offset the drop in replacement demand.

URWA Presents Wage Demands

Demands for a pay increase of 26 cents an hour for all workers in the rubber industry, effective November 1, were served on Goodrich, Goodyear, Firestone and U. S. Rubber on October 29th, following a two-day wage conference parley of the United Rubber, Cork, Linoleum & Plastics Workers of America (U.R.W.A.), held in South Bend, Indiana, on October 27 and 28. The union based its demand on cost-of-living increases and earnings of the rubber companies. The proposed increase, it was stated, would add $104,000,000 to the payroll of the industry. Any adjustment of this demand made with the "Big Four" is expected to set the pattern for the entire industry. The first corporation-wide bargaining discussion in the rubber industry, between the U.R.W.A. and the U. S. Rubber Co., was scheduled to start on November 7th.

Establish Beaufort Rubber Co.

The Beaufort Rubber & Chemical Co. has been established at 47 West 34th St., New York 1, N. Y., to engage in the manufacture of latex compounds, reclaim dispersions, resin emulsions, and latex adhesives, primarily for the shoe manufacturing industry. A factory is maintained at Cornwall-on-the-Hudson, N. Y. S. D. Wilson is president and H. F. Kenworthy, vice-president, of the new company. Mr. Wilson was formerly associated with the Old Town Rubber Co. and prior to that with the shoe products division of the Homasote Co. Mr. Kenworthy was one of the founders of Kenworthy Bros. Co., at Westboro, Mass., and was associated with the Cambridge Rubber Co. for more than 10 years. At one time he also served as president and general manager of Latex Process, Inc.

FINANCIAL NEWS

Boston Woven Hose & Rubber Co.

Year Ended August 31: Net income of $498,671, after deducting $463,500 for taxes, which is equal to $5.28 a common share, and which compares with $426,889, or $4.44 a share, for the previous fiscal year. Gross sales amounted to $11,243,386, as compared with $11,387,266 for the previous fiscal year. The consolidated balance sheet as of August 31, 1946, shows total current assets of $6,079,473 and total current liabilities of $1,073,126, a ratio of approximately 6 to 1. Inventories on August 31 amounted to $1,851,118, as compared with $1,476,757 at the end of the previous fiscal year.

General Cable Corp.

Nine Months: Net income of $1,333,719, which is equal to 35c a common share, and which compares with $1,509,015, or 48c a share, for the corresponding period of the previous year. The company had a net loss of $1,008,939 for the first six months of 1946. In the third quarter, net income amounted to $2,342,658, which is equal to $1.11 a share. No comparison with the third quarter of 1945 is available.

Thermoid Company

Nine Months: Net income of $887,129, which is equal to $1.31 each on 602,464 common shares, and which compares with $552,346, or 77c each on 600,000 common shares, for the corresponding period of the previous year. The company reported that estimated sales and earnings for September were the highest for any month in five years.

Flintkote Company

Year Ended October 5: Net income of $2,625,738, which compares with $1,608,464 for the previous fiscal year. Net sales for the 40 weeks ended October 5 amounted to $38,721,624, against $28,893,869 in the corresponding period of 1945.

Belden Manufacturing Co.

Nine Months: Net income of $523,363, which is equal to $1.79 each on 291,830 shares, and which compares with $317,000, or $1.19 each on 265,300 shares, for the corresponding period of the previous year.

Anaconda Wire & Cable Co.

Nine Months: Net income of $2,100,301, which is equal to $4.98 a share, and which compares with $640,503, or $1.52 a share, for the same period of 1945.

Hewitt-Robins, Inc.

Nine Months: Net income of $73,570, which includes a net income of $318,748 for the third quarter, and a $172,594 net profit in the second quarter which followed a loss of $417,772 for the first quarter of 1946.

Rome Cable Corp.

Six Months Ended September 30: Net profit of $470,914, which is equal to $2.39 a common share, and which compares with $171,773, or 90c a share, for the same period of the previous fiscal year.

Columbian Carbon Co.

Nine Months: Net income of $3,747,538, which is equal to $2.32 a share, and which compares with $2,348,750, or $1.46 a share, for the corresponding period of the previous year.

Pioneer Reviews Activities

Reviewing its activities for the fiscal year ending August 31, 1946, the Pioneer Rubber Co., Willard, Ohio, reported that for the year the company did the greatest volume of business in its twenty-nine-year history, with sales amounting to more than $2,500,000. This volume enabled the company to pay a dividend of 50c a share to stockholders. Additions to plants in Attica and in Willard, Ohio, the installation of new machinery and equipment, improved manufacturing methods, and experiments which enabled the company to replace natural rubber with synthetic rubber were cited as contributing factors to the company's biggest year. It was also revealed that the company's No. 3 plant in Willard is soon expected to start production.

Seeks Surplus Chemicals

The Weller Chemical Co., 1430 Massachusetts Ave., Cambridge 38, Mass., is currently interested in securing sizeable quantities of surplus chemicals from all sources. In a note to the trade, the company suggests manufacturers check their inventories and advise quantities available and prices desired.

OBITUARIES

G. N. Carter

G. N. Carter, manager of the budget sales department of the Goodyear Tire & Rubber Co., died of a heart attack at his home in Akron on October 3 at the age of 61. Born in England in 1883, Mr. Carter joined Goodyear in 1913 and was assigned to the company's Bowmanville, Canada, plant. He entered the armed forces of the British Empire in August, 1914, and saw combat duty in the Mesopotamia campaign. Returning from overseas in 1919, he rejoined Goodyear and was transferred to the Detroit district where he served in various sales capacities at Toronto, Rochester, and Buffalo. In 1931, Mr. Carter was transferred to budget sales and in 1937 was put in charge of the department. He relinquished that post on account of poor health in 1944, but following his recovery he was reinstated as manager of the department and was planning an extended business trip at the time he was stricken. A widow survives.

Mrs. Herbert E. Smith

Mrs. Alice C. Smith, wife of Herbert E. Smith, president of the U. S. Rubber Co., died at her home in New York City on October 13. Mrs. Smith was active in the affairs of St. Thomas Church in New York City and was a daughter of the late De Witt Clinton and Mrs. Carrie M. Crocherton. In addition to her husband, a daughter and two sons survive.

Hugh C. Boyle

Hugh C. Boyle, formerly superintendent for many years of the W. A. Clark Wire Co., now the Phelps Dodge Copper Products Corp., died at his home in Elizabeth, N. J., on October 22 after a long illness. He was 79 years old. Born in Tamaqua, Penna., Mr. Boyle was active in Democratic political circles for many years, serving as a member of the Elizabeth City Council from 1916 to 1918. After retiring from the Clark firm in 1931, Mr. Boyle, an authority on wire production, was associated with the American Wire & Cable Co., Chicago, Ill., and the American Steel & Wire Co., Baltimore, Md., in a supervisory capacity for a number of years. A widow, five sons and two daughters survive.

Edward Osborne

Edward Osborne, assistant treasurer of the Davol Rubber Co., Providence, R. I., died on November 4 at the age of 75 in St. Joseph's Hospital, Providence. Associated with the company for 47 years, Mr. Osborne served as accountant, chief accountant, and general auditor before being promoted to assistant treasurer nine years ago. He was treasurer of the Davol Mutual Benefit Association, and a member of the National Association of Cost Accountants and the Washington Park Community Club of Providence.

NEW EQUIPMENT

Thermofold Plastic Folding Machine

A new machine of advanced design which now makes possible folding of plastic sheeting ranging from .005 to .020-inch in thickness into a "U" type-180° fold, with sides tight together, has been introduced by the Taber Equipment Corp., North Tonawanda, N. Y. Called the "Thermofold" Plastic Folding Machine, the new unit provides a controlled folding cycle which

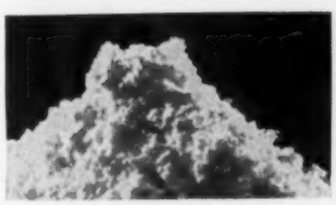
enables the average operator to turn out 700 "formed folds" per hour. Whenever folding in multiples is entirely practical, this production rate can be stepped up appreciably.

This formed fold is accomplished by means of thermostatically-controlled heat. Forming a fold in plastic sheeting by actually molding the material into the particular fold desired, the machine is reported to eliminate such faults of a crease or bend as tearing, cracking or opening up generally encountered in sheet plastic folding practice heretofore. It is, moreover, fully adjustable to accommodate all types of thermoplastic sheeting. Thermofold is also said to incorporate quality finishing and functional streamlining features, thereby expediting equipment maintenance. Corners and sharp edges have been avoided; the machine may be kept free of all dust and dirt accumulation.

The unit is hand fed and foot operated, with the actual fold cycle automatically controlled to insure trouble-free performance. Use of aluminum and fabricated steel in its construction is said to give the equipment a combination of lightness and strength. Fully enclosed yet readily accessible for inspection and check-up through hinged end doors, the mechanism requires little or no servicing, the manufacturer says, since it utilizes prelubricated ball bearings and oilless bushings, which not only assure virtually effortless

Rayco Fillers

Behind the Filler - the RESEARCH that fits it to your need EXACTLY



Rayco FILFLOC for non-marking Sole Compounds

With crude, synthetic or reclaim stocks, "Filfloc" minimizes marking and enhances abrasion and tear resistance. Maximum results are aided by our Research assistance which we gladly offer.

Working Sample upon Request

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SIMPLEX
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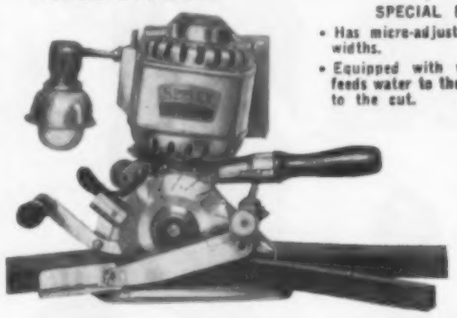
RUBBER STRIP CUTTER

PATENTED

A PORTABLE machine capable of stripping slab rubber up to 1″ thick at the rate of 20,000 feet in 8 hours. Any width desired.



SPECIAL FEATURES

- Has micro-adjustment for accurate widths.
- Equipped with water tank which feeds water to the slotted knife and to the cut.
- Has repulsion-induction motor which carries any overloads.
- Automatic sharpener device keeps knife keen and sharp.
- Has base with rollers and is very easy to handle.

Cuts within 1/64 inch to 1/100 inch tolerance depending on grades of rubber. Cuts a slab down to the last shaving. Cuts all grades of rubber including pure gum, sponge, etc. Cuts squarely—no rejects.

Now in use by many leading Rubber Manufacturers & Jobbers

Simplex Cloth Cutting Machine Co., Inc.

Manufacturers of a Complete Line of Cloth Cutting Machinery
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A REVOLUTIONARY MACHINE
For
INJECTION MOLDING OF RUBBER

This automatic injection molding machine is your answer for low cost, molded rubber parts with improved physical properties. In actual production, injection capacities as high as eight pounds per cycle have been secured, with curing time and finishing operations reduced to a minimum. For complete information on this revolutionary machine write today for Bulletin 4601.

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Mount Gilead, Ohio, U. S. A.

HPM
TURBOJECTOR
MOLDING MACHINE

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

operation but eliminate the necessity and expense of a power drive as well.

Mounted on the front of the Thermofold Plastic Folding Machine are an electric switch and two indicator lights. The first light tells when the electrical current is "on"; the second indicates when the thermostatic heat control is functioning, and goes "out" when thermostatic setting is reached. Other operating accessories include a dial-type thermometer to register temperature of the heated forming blade which has a working length of 16 inches, and an adjustable thermostat to regulate and adjust folding blade temperature.

Pyro Immersion Pyrometer

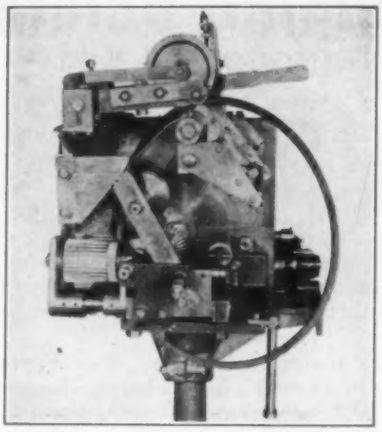
Pyrometer Instrument Co., 103 Lafayette St., New York 13, N. Y., has announced the development of a new Pyro Immersion Pyrometer, especially designed for the non-ferrous industries. The design of this new instrument includes a 4¾-inch indicator with a 4-inch direct reading scale calibrated from 0-1500° F. or 0-2500° F. or equivalent centigrade. Two models with over-all lengths of 27 and 43 inches are being manufactured, both having a specially designed swivel 8 inches from the connector block which permits the use of the pyrometer at any angle. The swivel is equipped with toothed notches preventing it from becoming loose during operation. The thermo-electric system is constructed with a permanent magnet, low resistance type galvanometer, has an external adjusting screw, and is enclosed in a shock, moisture, and dust proof steel case.

Electric Machinery Manufacturing Co., Minneapolis 13, Minn., has introduced a new line of **Hi-Fuse Polarized Field Synchronous Motor Controls** with current limiting fuses for general installation in industrial plants with high voltage service. These high-voltage combination starters are claimed to be applicable without necessity of engineering analysis of short circuit currents, yet provide interrupting capacity generally adequate for all except the largest distribution systems.

FOR RESISTANCE TO CUT AND CRACK GROWTH USE PHILBLACK A

FOR FURTHER DETAILS, SEE AD ON PAGE 132

Utility Crimper Type Flipper
for
Truck and Large Balloon Tires



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RUBBER PLANT EQUIPMENT

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- Complete Plant Design and Layout; also Special Machinery Developed and Manufactured.
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RUBBER & PLASTICS HEAVY DUTY MILLS

STURDY, dependable and built for long life, EEMCO Mills are made in standard sizes from the 12-inch Laboratory Mill up to and including an 84 inch Mill. Furnished as single units or for operation "in line" of two or more. Floor level drives are provided when wanted. Write EEMCO for your Rubber or Plastics Processing Machinery needs - - - early deliveries are now being made.

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OHIO
DUGAN & CAMPBELL
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953 EAST 12th ST., ERIE, PENNA.

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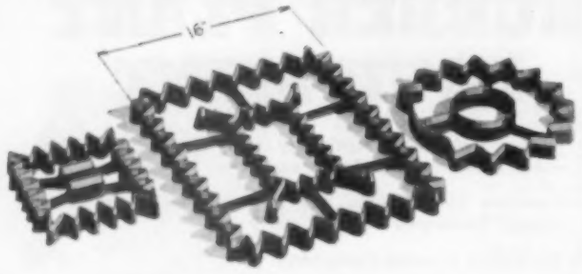
SHARP EDGE CUTTING DIES

Also PERFORATING TUBES and COLLETS of All Types



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Take Your Cutting Die Problems

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INDEPENDENT DIE & SUPPLY CO.

LaSalle & Ohio Sts., St. Louis 4, Mo.

RANDALL & STICKNEY

Hand Grip Rubber Gauge No. 3-B

Height	.....9"	Length	.....9¾"	Range	.....½"
Depth of Throat	...6½"	Dial 50 Divisions Each Div. 1/1000"		Weight	....4 lbs.
				Frame	. Aluminum

Designed for gauging stock as it is coming from the calender.

FRANK E. RANDALL CO., Waltham 54, Mass.

NEW EQUIPMENT (CONT'D)

A new thermocouple actuated limit switch, called the **Ashcroft Thermal Protector,** has been developed by Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn. The thermal protector is designed with two ranges, 100° F. to 1000° F. using an IC couple, and 800° F. to 2000° F. using an AC couple with an accuracy of 2% of the range at a set point.

With the introduction of a new **32-ounce injection molding machine** for making large plastic moldings, Lester-Phoenix, Inc., 2711 Church Ave., Cleveland 13, Ohio, is now manufacturing molding machines in the capacity range of 6, 8, 12, 16, 24 and 32 ounces. Hydraulic ejection after the mold is fully open is standard equipment on the large 16, 24 and 32 ounce machines, optional on others.

American Instrument Co., Silver Spring, Maryland, has introduced a new electric hygrometer for high-precision measurement and control of humidity. Called the **Aminco-Dunmore Electric Hygrometer,** this new instrument employs a sensing element that is claimed to be the speediest device known for measuring humidity changes, and which is compact, precise, and instantly responsive to microchanges in relative humidity.

A new **Ideal Insulation Resistance Tester** for checking insulation resistance in A.C. and D.C. equipment is available from Ideal Industries, Inc., Sycamore, Ill. Entirely self-contained, the tester has no batteries or external power supplies. The necessary power is provided by a small internal generator which is operated by a slowly turning crank. Correct testing voltage is indicated by two small button lights that glow at 500 volts D.C.

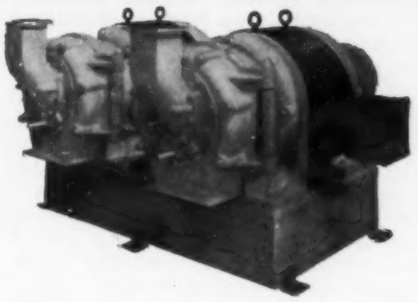
Porter-Cable Machine Co., Syracuse, N. Y., has added a light, narrow belt grinder attachment, known as **Type N-2,** to its line of abrasive belt grinders. The attachment is said to be capable of performing all kinds of light burring and grinding operations.

FOR EASY PROCESSING USE PHILBLACK A

FOR FURTHER DETAILS, SEE AD ON PAGE 132

ROBINSON
UNIQUE
PROCESSING EQUIPMENT

FRIGIDISC GRINDERS



This exceptionally sturdy, ruggedly constructed mill grinds material to finished size. Built-in cooling device. Cooling-liquid is continuously circulated against the back of each grinder disc. Robinson Processing Equipment of every type . . . Crushers, Grinders, Sifters, Attrition Mills . . . is designed to your requirements by experienced engineers. Literature available. Inquiries invited!

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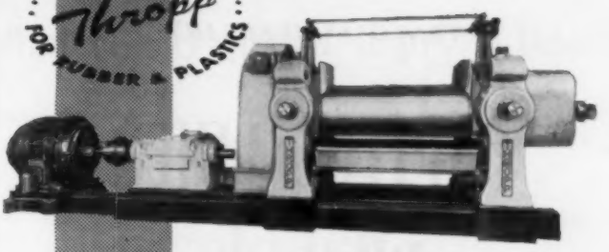
"CUSTOM BUILT" Thropp FOR RUBBER & PLASTICS



New Hi-Speed MILLS

22" & 22"x 60" Extra Heavy Duty

Extra Heavy Duty Individual Motor Driven Mill with 15" diameter journals, having 150 H.P. enclosed herringbone gear drive. Machine is equipped with solid bronze lined bearings having oil closure seals on side of the boxes facing the rolls to prevent oil contamination of the stock. Steel cut connecting gears and Johnson Rotary Joints. Manzel mechanical lubricator and new style guides bored to fit the rolls. This is just one of the many new Thropp precision built mills designed to speed up post war production.

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Thropp

WM. R. THROPP & SONS CO.
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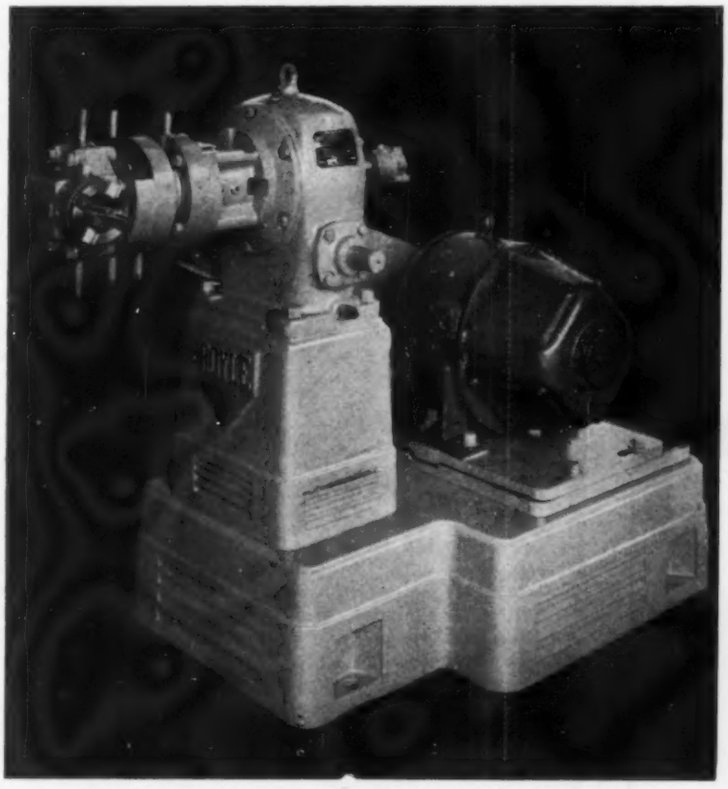

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Designed for Experimental and Product Extruding

Rugged is the word to describe this compact and highly efficient Royle continuous extruding machine. It embraces all of the characteristics required for larger and heavier extruding processes.

Primarily designed to become an integral part of laboratory equipment—the technician can be sure that his experiments will have a true relation to actual product extruding—the Royle #1 is an efficient producer of such commercial products as tubes, fine wire insulation, monofilament, and thread coating.

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TENTH ANNIVERSARY

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Whether untreated or treated liners, we will remove rubber deposits so you can put them back to productive use and thus save time and money.

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Originators of the Capitol Liner Process

REVIEWS

BOOKS

Organic Chemistry (Second English Edition). By Paul Karrer. Translated by A. J. Mee. Published by Elsevier Publishing Co., Inc., 215 Fourth Ave., New York 3, N. Y. 6½ x 9¾ in. 954 pp. $7.50.

The latest English edition of this well-known German work has been published and is being distributed in the public interest by authority of the Alien Property Custodian. The first English translation, published in 1938, was based on the fifth German edition, the corrections and additions for the sixth German edition, however, having been incorporated. This second English edition is based on the eighth German edition, translation of the additions and revisions incorporated being supplied by M. F. Darken. The original aim of the author, i.e., to provide students with a text book of organic chemistry and to make its problems more readily understood, is still followed. Special attention is paid to methods of synthesis and of determining the constitution of organic compounds. Methods of producing the majority of the compounds dealt with are described and proofs of their constitution and configuration discussed. A large number of tables, embodying both scientific and statistical material, is appended.

•

Handbook of Chemistry. (6th Edition). Compiled and Edited by Norbert Adolph Lange. Published by Handbook Publishers, Inc., Sandusky, Ohio. 5⅜ x 7¾ in. 2082 pp. $7.00.

The latest edition of this veritable one-volume library of chemical and physical data has been carefully revised and brought up-to-date. As the compiler indicates in his preface, perhaps the most important change in the edition is the completely revised and enlarged table of Physical Constants of Inorganic Compounds. This table has been increased to include over 2600 compounds with a corresponding list of more than 1300 synonyms. For the first time, wherever possible, data on refractive index has been included in the table. Considerable subject matter not in the previous edition is now incorporated, including modern concepts of matter, numerical values of the gas constant, and composition of sea water. Eleven tables, including that mentioned above, have been extended or completely rewritten, and two tables eliminated. Some data on the strictly engineering aspects has also been dropped from the new edition. As in past editions, the extensive index, which covers more than 3600 entries, is unusually complete.

•

German for the Scientist. (First American Edition). By Peter F. Wiener. Published by Chemical Publishing Co., 26 Court St., Brooklyn 2, N. Y. 5 x 7¼ in. 238 pp. $3.50.

Designed to teach the elements of scientific German to those employing German publications in their research or development work, this volume is divided into four parts. Part I gives a brief summary of the grammatical and constructional difficulties, and the elements of scientific German, with hints on how to avoid these difficulties; Parts II and III embrace passages in German taken from chemistry and physics literature, a vocabulary of the more important words being included at the end of each abstract; Part IV includes the complete, but not always literal, translation of all German passages of Parts II and III, enabling the user to check his translation efforts. The foreword and a few additional sections incorporated in this American edition were supplied by Dr. Paul Spoerri of the Polytechnic Institute of Brooklyn.

Industrial Carbon. (2nd Edition). By C. L. Mantell. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y. 6 x 9 in. 472 pp. $7.50.

Completely revised, due to the tremendous industrial progress achieved in the seventeen years which have transpired since the first edition was published, this new edition of "Industrial Carbon" fully covers the entire science and technology of carbon, from all of the older processes and methods that are still used to the most recent developments. As in the first edition, it treats fully with the natural forms of carbon, such as diamonds and graphite, covering their properties, processes and uses, as well as the varieties of carbon made by industrial processes, including carbon black, lampblack, acetylene black, bone black, vegetable carbon, and the great variety of gas adsorbents and other adsorbent carbons. Details of the manufacture of these numerous carbons are given and considerable space devoted to their specific applications in the production of rubber, pigments and a host of other products. The book is divided into three major sections, the first dealing with the elemental forms of carbon, the second with the adsorptive forms, and the third with the manufactured forms. There are 25 chapters in all, several of them having been supplied by experts in the specialized carbon fields. Separate chapters are provided for the discussion of analytical and testing methods and physical and chemical properties. Author and subject indexes are included.

•

Modern Packaging Encyclopedia: 1946-47. Published by Packaging Catalog Corp., 122 East 42nd St., New York 17, N. Y. 8½ x 11 in. 1036 pp. $6.00.

Now published under the title listed above, this book, known through seventeen previous editions as the "Packaging Catalog" takes on a name which more accurately describes its function. Retaining many of the desirable features of past editions, the current one has been considerably expanded and contains several new features, including an economic-historical review of the development of packaging, a symposium in which package designers dissect their own activity, a check list for package planning that embraces structural and economic elements as well as appearance factors, and a bibliography of current magazine literature pertinent to packaging. Specific reference is made in the volume to rubber derivatives as coatings, rubber hydrochloride film, and chlorinated rubber.

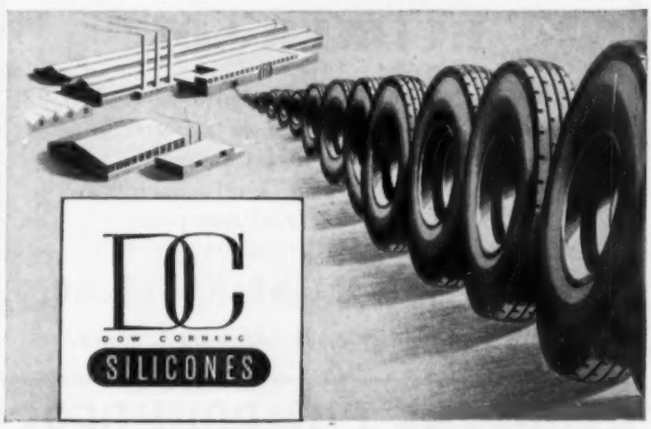
FOR LOW HEAT BUILD-UP,
USE PHILBLACK A

FOR FURTHER DETAILS, SEE AD ON PAGE 132

Save Time and Money
Reduce Scrap and Improve Quality

DC mold release emulsion No. 35

THE DOW CORNING SILICONE RELEASE AGENT



Many of the major rubber companies are changing to DC Mold Release Emulsion No. 35.

★ It does not build up on mold surfaces

Cost of cleaning molds is practically eliminated.

★ It improves surface quality and reduces scrap

This silicone mold lubricant gives quick release; does not decompose and therefore gives sharp patterns and clean molded surfaces.

★ It is inexpensive and easy to apply

Used in concentrations ranging from 50 to 150 parts of water to 1 part of the Emulsion, one application is frequently sufficient for several moldings. Easily applied by brushing or spraying.

For further information request leaflet V55 from

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FIRST IN SILICONES

Who doesn't want to

INCREASE PRODUCTION?

RUBBER-FLO

The amazing new mold lubricant. Saves the time and cost of cleaning rubber molds—it *keeps* them clean. The operators like it. It is odorless and non-toxic.

RUBBER-SOL

Cleans screens, valves, pipelines. It softens rubber—cured or uncured—used in salvaging metal inserts.

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NEOPRENE COMPOUNDERS!

***investigate* Baker's CALCINED MAGNESIA**

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Test it in wetting power—in ease of dispersion—stability of compounded stock—rate of cure—tensile strength and plasticity.

Learn why Baker's Light Calcined Magnesia is better.

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BOOKLETS, CATALOGS, etc.

Le Caoutchouc d'Hevea: Initiation Aux Methodes d'Exploitation en Indochine. (Hevea Rubber: Introduction to Methods of Cultivation in Indo-China). Published by Institut Francais du Caoutchouc, 42 Rue Scheffer, Paris, France. 7½ x 11 in. 160 pp.—400 francs (approximately $4.00). (In French.)

This book has a two-fold purpose, first to outline methods of rubber cultivation as practised in Indo-China and second to encourage young planters, botanists and agriculturists to investigate and embrace the rubber cultivation field. It is divided into three parts, the first devoted to a brief history of the rubber industry, descriptions of *Hevea brasiliensis* and other rubber-yielding plants, and the functions, collection and composition of latex; the second, more pertinent to cultivation, covers suitable climatic and soil conditions, selection and reproduction of high-yielding trees, density of planting, diseases of rubber trees, harvesting of latex, coagulation, sheeting, preparation of crepe, and preparation of specialty rubbers, such as powdered rubber; the third briefly describes the properties of raw and vulcanized rubber and some of the basic methods used in the manufacture of end products. The book is profusely illustrated with excellent photographs depicting every phase of rubber cultivation.

•

Indulin for Reinforcing Rubber. Industrial Chemical Sales Division, West Virginia Pulp & Paper Co., 230 Park Ave., New York 17, N. Y. 8½ x 11 in. 32 pp.

Indulin is a new reinforcing agent when incorporated into synthetic or natural rubbers in latex form, incorporation being achieved by coprecipitation. This booklet describes tests demonstrating some of the novel properties of Indulin-reinforced rubber, suggests some of its special possibilities, and outlines coprecipitation and compounding procedures found desirable with the new material. The test results shown cover a number of formulations containing Indulin in amounts from 10 to 150 parts (by weight). Among compounds for which Indulin is claimed to give special properties are carcass stocks, colored sidewall stocks, stitched color shoe soles, colored footwear, belting, low-sulfur hard rubbers, foam sponge extenders, and miscellaneous mechanical goods.

•

The Record of Rayon Cord in Tires. American Viscose Corp., 350 Fifth Ave., New York 1, N. Y. 5½ x 7¾ in. 24 pp.

The facts about rayon cord in tires, based upon results of laboratory and road tests on cords and tires, is concisely summarized in this booklet. Written in the form of a report to tire users, it explains first the functions of both the cord and the tire itself, then sets forth the proved characteristics of both rayon and natural cords. Tire performance is likewise analyzed in non-technical terms, and such aspects as mileage, impact, and heat resistance is explained in terms of tire construction. The reasons for rayon's claimed superiority are also given in the report. It concludes with experience reports of large users of tires.

•

GR-A Compounding. Naugatuck Chemical Division of United States Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y. 8½ x 11 in. 8 pp.

This is the first of a series of compounding research reports on GR-A (nitrile rubber). The current report covers the incorporation of Monex for acceleration and Sunproof for protection against ozone and atmospheric cracking in typical GR-A stocks. Physical test data for various stocks is given.

Raytherm Dielectric Heater. Industrial Electronics Division, Raytheon Manufacturing Co., Waltham 54, Mass. 8½ x 11 in. 8 pp.

The company's line of dielectric heating units, which find application in the rubber, plastics, textile and other fields, is described and illustrated in this bulletin. The speed-up advantages offered by dielectric heating are stressed and the specific operation is discussed. Complete specifications for Model D5G, a 5 kw general purpose dielectric heating unit, are given. According to the bulletin dielectric heat can be used with rubber for the following purposes: preheating prior to molding, vulcanization, devulcanization, setting and drying of foam sponge, drying of latex-dipped cord, preheating of tire carcasses prior to molding, and strip preheating in place of milling prior to extrusion.

•

Hercules Products. Hercules Powder Co., Wilmington 99, Del. 8½ x 11 in. 44 pp.

The company's chemicals and industrial explosives, as well as more than fifty industries which utilize these products are listed in this booklet. In a manner designed for easy reference, the products are first indexed according to various industries in which the chemicals and explosives are used and then according to chemical families, including the cellulose family, rosin family, synthetic resins, terpene solvents and chemicals, chlorinated products, explosives, blasting supplies and sporting powders, and special products. An indication of the many applications of the company's chemicals in the rubber, plastics, adhesives, film, textile, paints, and paper industries is also given.

•

Rubber Compounding Materials. (Laboratory Release No. 2). Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. 8½ x 11 in. 36 pp.

The effects of the company's compounding ingredients on GR-S stocks are discussed in this technical bulletin. Divided into three sections, the first contains test results on the behavior of Carbonex, Carbonex S, and Carbonex S Plastic softeners and extenders on a GR-S elastomer, while the second gives physical test data on a GR-S tread type stock in which Carbonex has been substituted for limited and selected proportions of channel black (EPC). The final section illustrates the behavior of DX, EX, and FX grades of Cumar in a GR-S-channel black (EPC) stock.

•

Silastic: The Dow Corning Silicone Rubber. (No. 1A). Dow Corning Corp., Midland, Mich. 8½ x 11 in. 4 pp.

This booklet contains information about some of the established uses for the company's heat-stable, semi-inorganic rubber-like material. Tables giving the physical and electrical properties and the chemical resistance of the six Silastic grades now available in commercial quantities are included. When properly cured, these Silastic stocks are said to have rubber-like properties which are not appreciably changed by temperatures up to 500° F. Some of them are reported not to stiffen at temperatures as low as —70° F.

•

Bristol Tachometers. (Bulletin No. S-1400). Bristol Co., Waterbury 91, Conn. 8 x 10½ in. 12 pp.

The company's complete line of instruments for recording and indicating speed of rotation and speed of travel of industrial machines is covered in this bulletin, which supersedes Bulletin No. 542. A complete description of the Pyromaster potentiometer-type tachometer is presented, together with a description of the millivoltometer-type indicating and strip-chart recording tachometers. Complete wiring diagrams, application data, and accessory information are given, including illustrations of instruments, magnetos, and a typical installation.

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Elasticity of Rubber-Like Materials

(Continued from page 196)

extensibility of the chains, and hence of the molecular network. The theoretical formulae (2 to 5) are based on the Gaussian formula (1) for the distribution of chain displacement lengths. This formula is an approximation based on assumptions which no longer hold when the displacement length r approaches the maximum outstretched length of the chain.

A more accurate statistical treatment of the problem of the distribution of chain displacement lengths would be required to cover this region of very large strains. Corrections of this kind have in fact been carried out by James and Guth *(10)* and by the author *(11)*, and incorporated into the theory of the molecular network in slightly different ways. The results are substantially identical, as may be seen from the modified stress-strain curve for elongation (Fig. 7) and represent at least qualitatively the shape of the experimental curves (cf. Fig. 5) over the whole range of extension.

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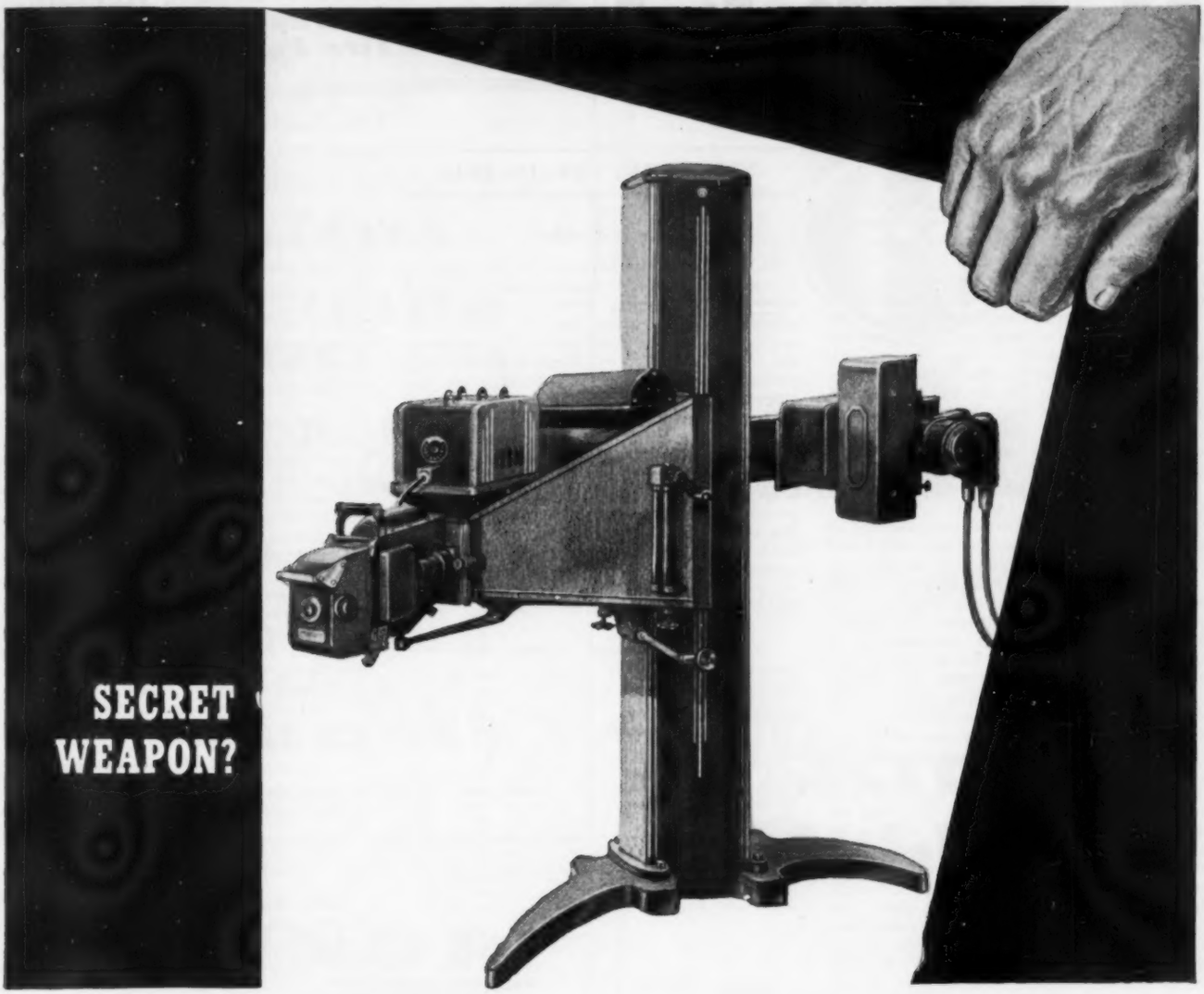

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THE RUBBER AGE

MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, NOV. 12, 1946

Natural Rubber

SEVERAL events in the past month were heartening to rubber dealers, importers, agents and others concerned with normal trading of rubber. The major event, of course, was the announcement by the British Board of Trade on November 5th that Britain would restore private trading in rubber and permit re-establishment of the London Rubber Exchange as of November 18. Under this move, private traders will be permitted to import rubber after January 1 and the Board of Trade will cease purchasing rubber as of that date. Regulations designed to prevent undesirable speculative financial transactions under cover of the market will be put into effect by the British Government in cooperation with the Rubber Trade Association of London.

The action of the British Government in restoring free trade in rubber was welcomed by rubber circles throughout the world, and in particular in Amsterdam circles. Dutch rubber authorities pointed out that once the political problems of Indonesia are settled and production of rubber restored on a normal scale, there will be an immediate market for the absorption and distribution of the rubber produced. Negotiations now being conducted between the Dutch authorities and leaders of the Indonesian people are expected to result in a workable agreement in the immediate future.

Also of special interest was the announcement issued today (November 12) that resumption of commodity futures trading on Commodity Exchange, Inc., in New York has been scheduled for November 19. Initial trading at the re-opening of the Exchange, which has been closed for more than four and a half years due to governmental controls and price restrictions, will be exclusively in raw hides. However, early resumption of trading in other commodities, including rubber, is anticipated.

Prices shown below are those established by the Office of Rubber Reserve:

Plantations—

Ribbed Smoked Sheets, No. 1X	.22½
Thick Pale Latex Crepe, No. 1X	.22½
Thin Pale Latex Crepe, No. 1X	.22½
Thick Brown Crepe, No. 1X	.21⅜
Thin Brown Crepe, No. 1X	.21⅜
Thick Remilled Blankets, No. 1	.21⅜
Thin Brown Remilled Crepe, No. 1	.21¼
Rolled Brown or Flat Bark	.18
Smoked Blankets, No. 1	.21⅛
Claro Brand 1XRSS	.22½
Sole Crepe Trimmings	.22
R.C.M.A. Wtmkd. Crepe No. 16	.26⅜
Sole Crepe	.22½

Wild—

Uncut Fines, Crude	.15
Cut Fines, Crude	.15½
Cut Fines, Washed & Dried	.22½
Islands Fine, Crude	.14⅝
Weak Fine, Crude	.14⅛
Cameta, Crude	.09¾
Upriver Coarse, Crude	.12⅝
Manicoba, Crude	.12¼
Caucho Ball, Crude	.11⅝
Panama Slab, Crude	.09⅝
Mangabiera, Crude	.08½
Cameroons, Crude	.16¼

Guayule—

Carload Lots	.17½
Less-than-Carload Lots	.18

Latex—

Normal, Tank Car Lots	.26
Normal, Carload Drums	.28¼
Normal, Less than 1 Drum	.35¼
Centrifuged, Tank Car Lots	.27¾
Centrifuged, Carload Drums	.29¼
Centrifuged, Less than 1 Drum	.36½

Scrap Rubber

Still further improvement in the demand for tires and a more liberal attitude toward shipments containing synthetic tires is reported by scrap rubber dealers. Most dealers are said to be considerably disturbed by the latest revision of Rubber Order R-1, under which the special markings on tire sidewalls designed to indicate the natural rubber content are no longer required, and dealers in the future will be guided by the size of the tire alone in this respect. Scrap dealers point out that they need all the distinguishing marks possible to help them properly segregate tires and other products. No change in the price structure has been made since OPA decontrolled prices, but some adjustments are expected. Prices shown below are those which were set by OPA on typical grades of scrap:

(Prices to Consumers, Delivered Akron)

Mixed passenger tires	ton	$20.00
Beadless truck tires	ton	26.00
Mixed truck tires	ton	20.00
Beadless passenger tires	ton	26.00
No. 1 passenger peelings	ton	52.25
No. 1 truck peelings	ton	52.25
No. 2 passenger tubes	lb.	.07¾
Red passenger tubes	lb.	.07½
Black passenger tubes	lb.	.06¾
Mixed passenger tubes	lb.	.06½
No. 2 truck tubes	lb.	.07½
Red truck tubes	lb.	.07¼
Black truck tubes	lb.	.06½
Buffings	ton	35.00
Bicycle tires	ton	15.00
Air bags and water bags	ton	15.00
Boots and shoes	ton	33.00

Cotton Tire Fabrics

Prices of cotton tire fabrics have moved up slightly since our last report but despite the over-all decontrol of prices those on chafer fabrics are still the same as those which prevailed during OPA days. Some adjustments can be expected in the near future, but it is believed that any increases will be nominal. The supply of tire fabrics is still tight, with most mills able to supply only 60 to 65% of customer requirements. No major change in this situation is anticipated in the near future. Current prices are indicated below:

Standard, Peeler, 12/4/2	lb.	.7405
Standard, Peeler, 14/4/2	lb.	.7542
Standard, Peeler, 16/4/3	lb.	.7680
Extra Staple, Peeler, 12/4/2	lb.	.8370
Extra Staple, Peeler, 14/4/2	lb.	.8508
Extra Staple, Peeler, 16/4/3	lb.	.8646

Chafers

14.4 oz (per sq. yard)	lb.	.7159
9.25 oz. (per sq. yard)	lb.	.7445
11.65 oz (per sq. yard)	lb.	.6444
8.9 oz. (per sq. yard)	lb.	.6873

Sheetings

48x40	36 in.	5.50	yd.	—	@13.276
40x40	36 in.	6.15	yd.	—	@11.890
40x36	36 in.	6.50	yd.	—	@10.723
48x48	40 in.	2.50	yd.	—	@27.594
48x48	40 in.	2.85	yd.	—	@23.075
56x60	40 in.	3.60	yd.	—	@19.229
48x44	40 in.	3.75	yd.	—	@18.830

Cotton

The price of middling uplands on the Cotton Exchange has swung in the phenomenal range of 1,049 points since our last report (October 14), high for the period being 39.19 on October 15 and low 28.70 on November 7. The average price of middling uplands for the month of October was 36.70, based on 23 trading days. After climbing nearly 1,000 points during the previous five months, prices dropped by the same amount during the first two weeks of the period. Although impetus to the rapid drop was furnished by the liquidation of an account by a New Orleans trader, most persistent among the reasons advanced for the decline was that cotton prices were simply too high. While the general trend during the period was downward, this movement was halted and reversed during the second week in November by the market's reconsideration of the short supply of cotton. With domestic consumption at the annual rate of 10,000,000 bales, as indicated by the Government's August and September figures, the reported drop in production to only 8,487,000 bales as of November 1 is expected to maintain prices at current or even higher levels. Quotations for middling uplands on the Exchange follow:

	Oct. 14	November 12		
	Close	High	Low	Close
December	38.50	31.30	30.60	30.90
March	38.05	30.75	30.00	30.25
May	37.60	30.05	29.37	29.61

Reclaimed Rubber

Little change has occurred in the reclaimed rubber field since our last report. Demand is still high, stemming from practically all branches of the rubber manufacturing field and calling for nearly all grades of reclaim. Prices are still being held at those set by OPA and no changes are anticipated in the near future unless scrap rubber prices are increased. The labor situation is still reported as satisfactory, although early demands for additional cost-of-living wage adjustments are expected, as they are throughout the rubber industry in general. Shipments of synthetic rubber reclaim on a carload basis are increasing in volume, but as yet few reclaimers are making any large deliveries of any type of reclaim to the export market. Prices shown below are those on typical grades of reclaim:

Shoe

Unwashed	lb.	.08	@	.08¼

Tube

Black Tube	lb.	.12¼	@	.12½
Red Tube	lb.	.13	@	.13¼

Tires

Black (acid process)	lb.	.08½	@	.08¾
Black, selected tires	lb.	.07½	@	.07¾
Truck, Heavy Gravity	lb.	.09½	@	.09¾

Miscellaneous

Mechanical blends	lb.	.05½	@	.06½
White	lb.	.14	@	.14¼

Ducks

Enameling (single filling)	lb.	—	@	69.676
Belting and Hose	lb.	—	@	67.166
Single filling, A grade	lb.	—	@	62.474
Double filling, A grade	lb.	—	@	66.560

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STATISTICS *Of Interest to the Rubber Industry*

U. S. Imports and Re-Exports of Natural Rubber

	GROSS IMPORTS												
	Natural Rubber (Dry)			Natural Rubber (Latex)			Guayule				RE-EXPORTS		TOTAL NET IMPORTS
Year	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Total Gross Imports Long Tons	Long Tons	Total Declared Value	Long Tons
1936	467,064	152,072,496	14.54	19,852	6,659,899	14.98	1,229	286,552	10.41	488,145	12,581	4,488,223	475,564
1937	574,600	237,307,041	18.44	23,185	10,213,670	19.67	2,694	745,873	12.36	600,479	7,902	3,385,433	592,577
1938	397,620	125,357,730	14.07	11,878	4,147,318	15.59	2,485	623,819	11.21	411,983	5,652	1,799,124	406,331
1939	469,803	167,558,245	15.92	27,438	10,467,552	17.03	2,232	463,345	9.27	499,473	13,125	5,832,618	486,348
1940	780,820	303,117,726	17.33	33,789	14,593,466	19.28	3,634	758,007	9.31	818,243	7,060	3,197,136	811,183
1941	989,329	401,890,393	18.14	34,798	15,965,627	20.48	4,881	1,145,767	10.48	1,029,008	5,376	2,757,872	1,023,632
1942	265,980	112,377,896	18.86	10,646	5,630,667	23.61	5,523	1,660,792	13.42	282,149	10,856	5,913,386	271,293
1943	50,348	31,364,033	27.81	1,890	1,312,202	30.99	7,679	3,636,789	21.14	59,917	22,587	16,446,707	37,330
1944	103,820	73,908,389	31.78	3,091	2,092,211	30.22	6,700	3,351,233	22.33	113,611	9,739	8,712,695	103,872
1945	134,454	95,850,441	31.82	4,773	3,115,853	29.14	10,040	5,963,797	26.52	149,267	9,509	7,201,746	139,758
1945:													
Jan.	15,626	11,125,799	31.71	206	134,890	29.18	880	476,377	24.17	16,712	1,316	1,024,712	15,396
Feb.	16,592	11,915,425	32.06	402	262,604	29.15	1,843	1,053,328	25.51	18,837	729	625,824	18,108
Mar.	10,254	7,297,267	31.77	434	283,209	29.13	652	384,518	26.33	11,340	1,979	1,420,759	9,361
Apr.	9,743	6,815,597	31.23	253	164,965	29.15	807	486,473	26.91	10,803	1,560	1,148,184	9,243
May	10,375	7,560,578	32.53	235	153,481	29.15	865	525,953	27.14	11,475	208	145,880	11,267
June	7,991	5,467,478	30.54	692	451,629	29.15	675	412,213	27.26	9,358	456	347,623	8,902
July	9,568	6,973,890	32.54	336	219,469	29.15	605	371,245	27.39	10,509	620	455,658	9,889
Aug.	9,741	6,880,325	31.53	624	407,677	29.15	841	506,655	26.91	11,206	894	824,976	10,312
Sept.	9,870	7,050,795	31.89	626	408,651	29.15	668	409,535	27.38	11,164	406	310,128	10,758
Oct.	10,673	7,645,618	31.98	287	187,422	29.15	646	391,971	27.07	11,606	562	369,296	11,044
Nov.	11,177	7,844,162	31.33	296	193,252	29.15	739	446,925	27.65	12,212	254	179,321	11,958
Dec.	12,844	9,273,507	32.24	382	248,604	29.15	819	498,604	27.20	14,045	525	349,385	13,520
1946:													
Jan.	18,580	13,515,971	32.48	569	371,857	29.15	446	263,279	26.33	19,595	164	41,992	19,431
Feb.	32,690	23,944,266	32.70	....	.....	.....	318	171,823	24.10	33,008	723	444,400	32,285
Mar.	31,093	22,520,391	32.33	504	328,905	29.15	160	87,344	24.34	31,757	714	488,044	31,043
Apr.	26,234	18,997,757	32.33	1,001	808,463	36.06	874	467,151	23.86	28,109	392	243,952	27,717
May	4,338	3,314,818	30.9	1,052	687,100	29.1	430	219,830	22.9	5,820	422	419,278	5,398
June	8,518	6,132,895	32.2	561	366,165	29.1	466	244,580	23.4	9,545	460	446,253	9,085
May	4,784*	3,314,818	30.93	1,052	687,100	29.11	430	219,830	22.82	6,266*	422	419,278	* 5,844
June	8,518	6,132,895	32.15	561	366,165	29.15	466	244,580	23.41	9,545	460	446,253	9,085
July	20,641	13,947,817	30.17	696	451,523	28.96	291	148,442	22.85	21,628	2,457	1,600,600	19,171
Aug.	34,125	18,656,966	24.41	1,231	803,435	29.14	366	193,680	23.06	35,722	1,515	902,005	34,207
Sept.	41,311	22,317,275	24.12	....	.....	....	425	219,849	23.09	.....	143	81,581	.....

Source: U. S. Department of Commerce.
Notes: (1) Figures for latex are on a dry weight basis. (2) Figures for re-exports include natural rubber (dry and latex) and guayule.

Natural Rubber
(Including Latex and Guayule)
(All Quantities in Long Tons)

Year	New Supply	Consumption	Re-Exports	Stocks On Hand at End of Period
1936	488,145	575,000	12,581	223,000
1937	600,479	543,600	7,902	262,204
1938	411,983	437,031	5,652	231,500
1939	499,473	592,000	13,125	125,800
1940	818,243	648,500	7,060	288,864
1941	1,029,007	775,000	5,376	533,344
1942	282,653	376,791	10,856	422,714
1943	55,329	317,634	20,815	139,594
1944	107,834	144,113	9,665	93,650
1945	135,672	105,429	6,743	118,715
1945:				
Jan.	15,742	11,411	802	97,179
Feb.	20,427	10,228	425	106,953
Mar.	9,146	10,983	1,797	103,319
Apr.	10,046	9,793	867	102,705
May	10,067	10,164	130	102,478
June	9,940	8,995	204	103,219
July	8,739	7,698	756	103,504
Aug.	10,259	7,392	777	105,594
Sept.	12,150	5,799	568	111,385
Oct.	13,984	7,206	78	118,085
Nov.	7,288	7,575	255	117,543
Dec.	7,884	8,185	92	118,715
1946:				
Jan.	25,143	10,355	209	133,294
Feb.	35,104	10,131	290	157,977
Mar.	35,348	12,792	445	180,088
Apr.	19,847	16,914*	190	182,831*
May	6,126	17,867	327	170,763
June	23,382	16,466	911	176,768
July	14,942	21,998	222	169,490
Aug.	45,087	28,405	592	185,580
Sept.	46,122	31,133	988	199,581

Source: 1936-40, U. S. Department of Commerce; 1941 to date, Civilian Production Administration. * Revised.

U.S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

(All Quantities in Long Tons)

Year	Balata		Jelutong		Gutta-Percha & Other Guttas	
	Tons	Value	Tons	Value	Tons	Value
1936	535	199,368	6,163	1,296,364	1,568	555,643
1937	354	151,344	7,109	2,017,786	1,122	440,894
1938	509	181,140	9,132	2,944,504	444	204,582
1939	694	265,553	6,640	1,603,418	1,740	539,255
1940	648	300,500	7,451	2,449,137	2,340	1,004,885
1941	924	489,514	8,821	2,954,001	1,783	607,025
1942	1,544	1,107,059	1,200	530,296	804	525,763
1943	1,047	708,701	35	14,840	....	.....
1944	1,012	660,805	88	45,578	10	4,999
1945	1,361	907,253	....	.....	36	21,970
1945:						
Jan.	121	74,964	....	.....	....	.....
Feb.	24	17,441	....	.....	....	.....
Mar.	150	69,291	....	.....	....	.....
Apr.	36	18,486	....	.....	....	.....
May	110	60,465	....	.....	3	3,244
June	8	6,872	....	.....	....	.....
July	228	128,129	....	.....	....	.....
Aug.	154	80,296	....	.....	....	.....
Sept.	49	52,148	....	.....	5	2,196
Oct.	130	83,173	....	.....	....	.....
Nov.	303	257,246	....	.....	10	6,547
Dec.	48	58,742	....	.....	18	9,983
1946:						
Jan.	129	121,228	....	.....	....	.....
Feb.	38	35,699	....	.....	5	2,178
Mar.	100	70,315	....	.....	....	.....
Apr.	362	261,098	....	.....	....	.....
May	325	212,899	....	.....	....	.....
June	80	80,006	....	.....	....	.....
July	219	178,564	115	91,412	7	19,839
Aug.	234	249,380	....	.....	4	13,438
Sept.	159	161,937	4	9,337	23	47,147

Source: U. S. Department of Commerce.

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Trade Mark

Synthetic Rubber

(GR-S, Neoprene, Butyl, and Buna N Types)

(All Quantities in Long Tons)

Year	Production	Imports	Consumption	Exports	Stocks On Hand at End of Period
1941	8,383	.....	6,259	672	1,702
1942	22,434	.....	17,651	1,419	4,612
1943	231,722	.....	170,891	18,148	41,568
1944	762,630	11,043	566,670	104,266	142,927
1945	820,373	10,407	693,580	83,778	203,454
1945:					
Jan.	79,037	1,040	64,938	9,253	153,170
Feb.	71,530	483	60,400	6,712	160,169
Mar.	77,298	417	63,846	4,664	169,704
Apr.	75,846	751	59,437	6,688	180,487
May	83,309	1,418	62,837	7,435	193,663
June	78,702	1,270	58,627	7,363	203,018
July	78,650	1,428	52,571	12,085	218,369
Aug.	69,703	1,491	54,439	10,856	224,117
Sept.	63,754	928	45,479	3,801	239,683
Oct.	47,317	237	58,667	1,596	226,550
Nov.	48,634	471	56,227	7,984	214,289
Dec.	46,593	473	56,112	5,341	203,454
1946:					
Jan.	56,089	.....	66,993	5,715	177,051
Feb.	51,848	....	63,770	6,415	144,427
Mar.	60,363	1,429	74,214	17,707	115,310
Apr.	66,014	536	70,703*	12,878*	101,510*
May	66,044	366	70,914	13,102	93,447
June	63,388	415	82,899*	5,161*	94,095*
July	63,176	353	54,562	3,175	101,007
Aug.	64,300	634	61,486	2,175	103,076
Sept.	63,774	1,031	58,679	2,480	108,968

Source: Civilian Production Administration.
Note: Production figures include the output of privately-owned and government plants. Figures for 1941 are estimated. * Revised.

Synthetic Rubber — By Type

(All Quantities in Long Tons)

New Supply

	GR-S (Buna S)	GR-M (Neoprene)[b]	GR-I (Butyl)	Buna N Types[b]	Total
1942	3,721	8,956	.....	9,734	22,411
1943	182,259	33,603	1,373	14,487	231,722
1944	679,949	56,660	20,252	16,812	773,673
1945	725,000	45,500	51,900	7,900	830,300
1946[c]	610,000	44,000	70,000	5,500	729,500

Consumption

1942	2,579	6,833	.....	8,217	17,629
1943	131,977	26,205	304	12,405	170,891
1944	495,552	46,243	10,763	14,112	566,670
1945[a]	676,600	48,400	43,700	8,500	777,200

Exports

1942	222	1,037	.....	160	1,419
1943	20,357	2,769	40	709	23,875
1944	99,242	5,093	630	679	105,644
1945	.....	.....	.....	.....	.....

Stocks at End of Period

1942	1,050	1,786	.....	1,772	4,608
1943	30,975	6,415	1,033	3,145	41,568
1944	116,130	11,739	9,892	5,166	142,927
1945	165,000	9,200	18,000	4,700	196,900

Sources: From miscellaneous Government reports.
Notes: [a] Consumption figures for 1945 include exports; [b] Including production of privately-owned plants; [c] Estimated.

Gasoline Consumption

(In Thousands of Barrels of 42 Gallons)

	1939	1940	1941	1942	1943	1944	1945	1946
Jan.	38,089	40,370	46,190	49,216	36,085	47,540	51,125	51,186
Feb.	34,928	37,557	42,782	42,666	36,274	47,754	49,013	47,889
Mar.	43,042	44,607	49,572	50,820	41,586	52,263	55,449	56,801
Apr.	44,264	47,683	55,879	49,554	48,177	50,005	59,147	62,045
May	49,766	52,946	60,121	53,212	49,828	54,230	60,828	66,774
June	50,133	55,459	59,062	50,077	52,325	54,266	60,597	63,221
July	50,689	53,865	63,906	54,606	49,867	55,119	66,218	69,044
Aug.	54,025	55,346	63,575	48,793	51,880	55,616	70,027	66,701
Sept.	49,505	52,297	59,768	50,093	49,707	56,318	64,550	.....
Oct.	49,854	53,807	58,412	50,094	53,111	53,154	55,743	.....
Nov.	47,407	49,074	54,670	50,729	50,703	54,967	53,581	.....
Dec.	43,807	46,413	53,568	39,250	48,695	52,250	50,129	.....
Total	555,509	589,424	667,505	589,110	568,238	633,482	696,407	.....

Source: U. S. Bureau of Mines.

Reclaimed Rubber

(Including Natural and Synthetic)

(All Quantities in Long Tons)

Year	Production	Consumption Tons	Consumption % to Crude	Exports	Stocks On Hand at End of Period
1936	150,571	141,486	24.6	7,085	19,000
1937	185,033	162,000	29.8	13,233	28,800
1938	122,400	120,800	27.6	7,403	23,000
1939	186,000	170,000	28.7	12,611	25,250
1940	208,971	190,244	29.3	11,347	32,636
1941	274,202	251,231	32.2	13,851	41,750
1942	285,114	254,820	64.6	30,405	42,532
1943	303,991	291,082	59.6	15,678	46,201
1944	260,607	251,083	35.3	11,800	43,832
1945	243,309	241,036	30.2	13,413	28,155
1945:					
Jan.	21,992	20,777	27.2	1,419	43,628
Feb.	20,131	20,760	29.4	1,055	39,444
Mar.	22,042	22,891	30.6	1,409	37,186
Apr.	20,389	20,234	29.2	1,125	36,216
May	22,249	22,459	30.8	971	35,035
June	20,187	19,873	29.4	996	34,353
July	17,033	15,976	26.5	836	34,574
Aug.	18,804	18,663	30.2	834	33,881
Sept.	17,246	17,365	33.9	1,323	32,439
Oct.	22,044	22,185	33.7	1,195	31,103
Nov.	20,560	20,263	31.8	859	30,541
Dec.	20,632	19,590	30.5	1,391	28,155
1946:					
Jan.	24,458	22,031	28.5	1,253	29,099
Feb.	23,187	20,702	28.0	1,368	30,216
Mar.	25,136	22,075	26.0	1,841	31,436
Apr.	23,930*	22,396*	25.8	1,238	31,732*
May	25,322	22,162	24.9	1,338	33,554
June	24,882*	21,725*	27.4	1,416	35,470
July	22,619	21,350	27.9	961	35,603
Aug.	25,798	24,566	27.3	1,093	35,742
Sept.	23,981	23,732	26.4	579	35,412

Source: 1936-40, Department of Commerce; 1941 to date, Civilian Production Administration. * Revised.

Automobile Production in U. S.

(Civilian Production Only)

Year	Passenger Cars	Trucks	Total	Year	Passenger Cars	Trucks	Total
1930	2,784,745	571,241	3,355,986	1938	2,000,985	485,852	2,486,837
1931	1,973,090	416,648	2,389,738	1939	2,866,796	704,308	3,571,104
1932	1,135,491	235,187	1,370,678	1940	3,692,328	721,637	4,413,965
1933	1,573,512	346,545	1,920,057	1941	3,744,300	875,381	4,619,681
1934	2,177,919	575,192	2,753,111	1942	220,814	133,083	353,897
1935	3,252,244	694,690	3,946,934	1943	0	4,501	4,501
1936	3,669,528	781,862	4,451,390	1944	0	124,819	124,819
1937	3,915,889	892,382	4,808,271	1945	83,792	313,643	397,435
1945							
Jan.	0	15,019	15,019	July	359	31,394	31,753
Feb.	0	14,032	14,032	Aug.	1,381	27,532	28,913
Mar.	0	18,339	18,339	Sept.	580	30,106	30,686
Apr.	0	18,980	18,980	Oct.	16,839	40,900	57,739
May	0	22,315	22,315	Nov.	34,611	53,103	87,714
June	0	23,131	23,131	Dec.	30,022	28,792	58,814
1946							
Jan.	56,367*	45,461*	101,828*	July	209,180	88,316	297,496
Feb.	57,782*	35,179*	92,961*	Aug.	247,261	98,948	346,209
Mar.	85,810*	38,160*	123,970*	Sept.	232,280	96,475	328,755
Apr.	130,816*	81,710*	212,526*	Oct.	.....	.....	.....
May	168,759*	76,162*	244,921*	Nov.	.....	.....	.....
June	141,090*	60,812*	201,902*	Dec.	.....	.....	.....

Source: Automobile Manufacturers Association.
Note: Figures are based on factory sales. * Revised.

Rim Production

	1940	1941	1942	1943	1944	1945
Passenger Car	17,026,812	17,828,994	1,025,880	780,291	1,748,917	4,504,368
Truck & Bus	3,857,316	6,464,725	5,298,603	4,949,004	6,391,441	6,486,652
Agricultural	1,004,319	1,576,720	194,900	301,997	997,301	1,441,909
Earth Mover	2,767	2,593	1,814	945	703	1,308
Total	21,891,214	25,873,032	6,521,197	6,032,237	9,138,362	12,434,237

1946	Apr.	May	June	July	Aug.	Sept.
Passenger Car	1,074,479	1,155,792	1,026,227	1,364,704	1,480,253	1,489,104
Truck & Bus	457,821	316,796	409,094	372,871	501,071	555,870
Agricultural	133,502	115,491	162,838	59,938	119,399	140,558
Earth Mover	328	251	309	311	342	103
Total	1,666,130	1,588,330	1,598,468	1,797,824	2,101,065	2,185,635

Source: The Tire & Rim Association, Inc.

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TRENTON, N. J.—General Supply & Chemical Co.

Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1935 (total)	19,263	29,406	1,514	50,183	49,362	8,196
Passenger Car	17,063	26,036	948	44,047	43,256	7,054
Truck and Bus	2,200	3,370	566	6,136	6,106	1,142
1936 (total)	21,446	30,866	1,073	53,385	56,041	10,717
Passenger Car	18,941	26,999	644	46,584	49,013	9,291
Truck and Bus	2,505	3,867	429	6,801	7,028	1,426
1937 (total)	22,353	29,886	1,246	53,485	53,310	10,383
Passenger Car	20,055	26,177	696	46,928	46,497	8,745
Truck and Bus	2,298	3,709	550	6,557	6,813	1,638
1938 (total)	11,516	30,567	1,049	43,132	40,907	8,451
Passenger Car	10,086	27,104	580	37,770	35,789	6,937
Truck and Bus	1,430	3,463	469	5,362	5,118	1,514
1939 (total)	18,208	38,022	1,279	57,509	57,613	8,665
Passenger Car	15,742	33,471	607	49,820	49,933	7,108
Truck and Bus	2,466	4,551	672	7,689	7,680	1,557
1940 (total)	22,252	35,346	1,176	58,774	59,186	9,127
Passenger Car	19,560	30,903	411	50,874	50,965	7,270
Truck and Bus	2,692	4,443	765	7,900	8,221	1,857
1941 (total)	24,780	39,895	1,489	66,164	61,540	4,436
Passenger Car	19,855	34,119	586	54,560	50,392	3,165
Truck and Bus	4,925	5,776	903	11,604	11,148	1,271
1942 (total)	6,680*	8,872*	207*	15,759*	15,351*	6,247*
Passenger Car	910*	2,734*	38*	3,682*	2,790*	4,432*
Truck and Bus	5,770*	6,138*	169*	12,077*	12,561*	1,815*
1943 (total)	6,128	18,547	225	24,900	20,423	1,883
Passenger Car	82	10,606	71	10,759	7,620	1,132
Truck and Bus	6,046	7,941	154	14,141	12,803	751
1944 (total)	6,654	26,439	[illegible]	33,356	33,446	2,013
Passenger Car	208	18,330	130	18,668	18,819	1,218
Truck and Bus	6,446	8,109	133	14,688	14,627	795
1945 (total)	5,984	36,479	504	42,967	44,524	3,077
Passenger Car	1,115	25,463	222	26,800	28,200	2,214
Truck and Bus	4,869	11,016	282	16,167	16,324	863
1946:						
Mar. (total)	730	5,786	105	6,621	6,686	3,392
Passenger Car	516	4,739	47	5,302	5,310	2,383
Truck and Bus	214	1,047	58	1,319	1,376	1,009
Apr. (total)	1,105	5,756	128	6,989	6,883	3,304
Passenger Car	774	4,752	57	5,583	5,515	2,327
Truck and Bus	331	1,004	71	1,406	1,368	977
May (total)	1,259	5,660	112	7,032	7,060	3,377
Passenger Car	895	4,730	51	5,676	5,700	2,386
Truck and Bus	364	930	61	1,356	1,360	991
June (total)	925	5,075	134	6,134	6,036	3,309
Passenger Car	711	4,279	56	5,046	4,921	2,290
Truck and Bus	214	796	78	1,088	1,115	1,019
July (total)	1,529	4,610	107	6,247	5,985	2,891
Passenger Car	1,122	3,840	48	5,010	4,924	2,052
Truck and Bus	407	770	59	1,237	1,061	839
August (total)	1,685	4,997	144	6,825	7,054	3,006
Passenger Car	1,238	4,190	66	5,493	5,791	2,288
Truck and Bus	447	807	78	1,332	1,263	718

Source: The Rubber Manufacturers Association, Inc. * Revised.

Cotton, Rayon and Nylon Tire Fabrics

(Production in Thousands of Pounds)

	Cotton				Rayon and Nylon [b]		
	Tire Cord Not Woven	Cord Fabric Woven	Chafer and All Other Tire Fabrics	Total	Tire Cord Not Woven	Tire Cord And Other Tire Fabrics	Total
1943:							
Jan.-Mar.	11,155	34,287	7,819	53,261	564	9,833	10,397
Apr.-June	11,625	34,684	8,549	54,858	1,253	10,185	11,438
July-Sept.	15,754	36,854	9,618	62,226	1,220	9,184	10,404
Oct.-Dec.	15,928	42,639	10,464	69,031	1,806	12,055	13,861
Total	54,462	148,464	36,450	239,376	4,843	41,257	46,100
1944:							
Jan.-Mar.	17,135	42,783	11,452	71,370	1,812	15,830	17,642
Apr.-June	17,587	40,580	11,499	69,666	1,353	19,586	20,939
July-Sept.	16,653	38,462	11,055	66,170	1,299	25,915	27,214
Oct.-Dec.	12,982	34,107	10,948	58,037	2,773	33,630	36,403
Total	64,357	155,932	44,954	265,243	7,237	94,961	102,198
1945:							
Jan.-Mar.	16,671	43,835	12,306	72,812	3,726	37,777	41,503
Apr.-June	16,044	42,383	13,604	72,031	4,064	42,476	46,540
July-Sept.	15,136	38,158	14,122	67,416	3,549	42,606	46,155
Oct.-Dec.	15,514	36,442	13,573	65,529	a	47,734	47,734
Total	63,365	160,818	53,605	277,788	11,339	170,593	181,932
1946:							
Jan.-Mar.	17,128*	39,377*	15,245*	71,750*	a	51,208*	51,208*
Apr.-June	19,622	40,197	18,623	78,442	a	52,511	52,511

Source: U. S. Bureau of the Census.
Notes: (a) Included with tire cord and fabrics to avoid disclosures of operations of individual mills. (b) Fuel cell fabrics are not included with rayon and nylon tire cord and fabrics. * Revised.

Automotive Inner Tubes

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1935	19,218	28,095	754	48,067	47,879	8,231
1936	21,514	32,188	721	54,423	57,036	10,945
1937	22,464	29,554	749	52,767	52,373	10,312
1938	11,515	28,134	644	40,293	37,848	8,166
1939	18,190	31,998	1,002	51,190	50,649	7,036
1940	22,172	29,070	972	52,214	52,237	7,017
1941	24,722	33,749	1,232	59,703	57,433	4,686
1942	n.a.	n.a.	n.a.	13,958	12,568	5,742
1943	6,183	12,373	176	18,732	15,260	2,584
1944	6,461	19,739	190	26,390	26,750	2,823
1945	6,119	33,161	408	39,688	41,102	3,671
1946:						
Jan.	602	3,602	83	4,287	4,640	4,121
Feb.	492	3,806	88	4,386	4,874	4,418
Mar.	764	4,776	109	5,649	5,840	4,519
Apr.	1,113	4,842	124	6,079	6,114	4,190
May	1,268	4,903	107	6,278	6,463	4,373
June	931	4,648	121	5,700	5,710	4,377
July	1,513	4,345	101	5,959	5,702	3,954
Aug.	1,697	5,107	127	6,931	7,032	3,929

Source: The Rubber Manufacturers Association, Inc.
n.a.—Not available.

Smoked Sheets—Spot Closing Prices

(New York Market—Cents per pound)

Year	High	Low	Avg.	Year	High	Low	Avg.
1910	288	141	206.60	1928	41¼	17	22.48
1911	184	114	141.30	1929	26⅞	15½	20.55
1912	140	108	121.60	1930	16½	7½	11.98
1913	113	59	82.04	1931	8⅝	4¼	6.17
1914	93	56	65.33	1932	4⅜	2½	3.49
1915	79	58½	65.85	1933	9⅞	2⅞	5.96
1916	102	55	72.50	1934	15⅞	8¾	12.92
1917	90	52	72.23	1935	13¾	10½	12.37
1918	70	40	60.15	1936	23	13½	16.41
1919	57	38½	48.70	1937	26⅜	14	19.39
1920	56½	16	36.30	1938	17⅛	10¼	14.64
1921	21¾	11½	16.36	1939	24	14⅛	17.57
1922	28⅜	13⅜	17.50	1940	24	18¼	20.10
1923	37⅛	24⅜	29.45	1941	24⅞	19⅛	22.48
1924	40⅛	17⅝	26.20	1942	22½	22½	22.50
1925	121	34⅜	72.46	1943	22½	22½	22.50
1926	88½	36¾	48.50	1944	22½	22½	22.50
1927	41¾	33	37.72	1945	22½	22½	22.50

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market—in Cents)

Average Monthly Price Per Pound

	1939	1940	1941	1942	1943	1944	1945	1946
Jan.	8.94	11.19	10.66	19.85	21.34	20.76	22.36	25.49
Feb.	8.97	11.10	10.87	20.05	21.61	21.34	22.29	26.57
Mar.	9.00	10.90	11.08	20.42	21.98	21.65	22.43	27.52
Apr.	8.87	10.89	11.48	21.10	22.02	21.71	21.88	28.40
May	9.56	10.33	12.97	20.88	21.97	21.63	23.30	28.17
June	9.88	10.72	14.66	19.78	21.92	22.31	23.42	29.89
July	9.71	10.42	16.55	20.27	21.46	22.33	23.27	34.11
Aug.	9.30	9.84	17.06	19.45	21.09	22.11	23.10	36.31
Sept.	9.30	9.69	17.94	19.62	21.10	22.10	23.25	37.59
Oct.	9.24	9.62	17.31	19.79	21.00	22.32	23.85	36.79
Nov.	9.73	9.97	17.21	20.21	20.32	22.13	24.71	....
Dec.	10.97	10.18	18.09	20.55	20.32	22.28	25.21	....
Average for Year	9.46	10.40	14.66	20.16	21.34	21.89	23.25	....

Consumption of Vinyl Resins

(In Thousands of Pounds)

	Sheeting and Film [a]	Textile and Paper Coating Resins [b]	Molding and Extrusion Materials [a]	Adhesives [b]	All Other [c]
1946:					
Jan.	1,569	1,650	5,496	399	352
Feb.	1,666	1,035	5,910	390	589
Mar.	2,161	1,689	6,665	....	1,276
Apr.	2,243	1,436	5,265	....	1,804*
May	2,375	1,397	4,666	....	2,188*
June	1,857	1,235	4,978	....	2,402*
July	2,108	2,134	5,512	....	2,972*
Aug.	2,426	2,910	4,874	....	2,733*
Sept.	1,054	3,103	4,886	....	2,792*

Source: Bureau of the Census.
Notes: (a) Includes weight of fillers, plasticizers and extenders; (b) Resin content; (c) Excludes data for protective coating resins. * Includes Adhesives.

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Borax	Cream of Tartar	Sodium Hydrosulphide	Tartar Emetic
Boric Acid	Chlorine	Stripper, Textile	Tartaric Acid
Citric Acid	Muriatic Acid	Sulphur	Titanium Tetrachloride
	Nitric Acid	Sulphuric Acid	

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APOPKA, FLORIDA

Rubber Industry Employment, Payrolls, Wages and Hours

Employment — Thousands of Production Workers and Index (1939 = 100)

Month	1945 All Rubber Products Number	1945 All Rubber Products Index	1945 Rubber Tires & Tubes Number	1945 Rubber Tires & Tubes Index	1946 All Rubber Products Number	1946 All Rubber Products Index	1946 Rubber Tires & Tubes Number	1946 Rubber Tires & Tubes Index
Jan.	199	164.9	97	178.5	209	172.7	99	182.4
Feb.	200	165.1	96	178.0	214	177.1	101	187.3
Mar.	209	173.2	96	176.8	220	181.5	104	191.6
Apr.	205	169.6	93	172.2	220*	182.0*	104	192.8
May	201	166.6	92	169.2	221*	182.7*	105	193.4
June	199	164.5	90	166.7	225	186.1	106	195.8
July	194	160.5	88	162.1	218	180.2	99	183.1
Aug.	191	158.0	86	159.3	224	185.2	...	....
Sept.	165	136.5	72	132.7	...	....	...	....
Oct.	187	154.4	88	163.0	...	....	...	....
Nov.	194	160.1	91	168.9	...	....	...	....
Dec.	203	168.2	96	177.8	...	....	...	....

Payrolls — Production Workers Pay Rolls Unadjusted Index (1939 = 100)

Month	1944 All Rubber Products	1944 Rubber Tires & Tubes	1945 All Rubber Products	1945 Rubber Tires & Tubes	1946 All Rubber Products	1946 Rubber Tires & Tubes
Jan.	291.0	288.9	323.2	342.4	290.1	272.6
Feb.	295.7	295.6	323.6	339.8	292.1	271.9
Mar.	297.0	299.3	315.4	301.9	302.8	281.1
Apr.	281.3	280.0	315.9	306.0	324.9	312.9
May	283.3	283.0	299.8	288.6	327.6	314.2
June	281.4	278.5	304.3	293.8	337.2	318.3
July	279.7	280.9	298.7	286.8	327.2	304.3
Aug.	291.0	294.3	265.7	249.7	....	....
Sept.	294.5	300.8	231.3	211.4	....	....
Oct.	293.3	297.5	254.2	239.8	....	....
Nov.	293.6	298.2	257.8	240.2	....	....
Dec.	308.5	319.4	275.5	256.7	....	....

Wages — Average Weekly Earnings

Month	1944 All Rubber Products	1944 Rubber Tires & Tubes	1945 All Rubber Products	1945 Rubber Tires & Tubes	1946 All Rubber Products	1946 Rubber Tires & Tubes
Jan.	$48.18	$55.79	$54.49	$64.29	$46.71	$50.29
Feb.	48.95	57.21	54.40	64.04	46.05*	49.21*
Mar.	49.53	58.38	50.62	57.29	46.46*	49.72
Apr.	48.12	55.63	51.93	59.75	49.67*	54.77*
May	48.98	57.11	50.09	57.32	49.82	54.72
June	49.30	56.78	51.45	59.20	50.45	54.76
July	49.17	57.01	51.81	59.59	50.60	56.11
Aug.	50.24	58.62	46.76	52.81	....	....
Sept.	50.99	59.33	47.20	53.59	....	....
Oct.	50.92	58.54	45.57	49.48	....	....
Nov.	50.59	58.30	44.68	47.78	....	....
Dec.	52.64	61.62	45.48	48.54	....	....

Wages — Average Hourly Earnings

Month	1944 All Rubber Products	1944 Rubber Tires & Tubes	1945 All Rubber Products	1945 Rubber Tires & Tubes	1946 All Rubber Products	1946 Rubber Tires & Tubes
Jan.	$1.066	$1.224	$1.151	$1.317	$1.121	$1.255
Feb.	1.072	1.240	1.149	1.314	1.129	1.266
Mar.	1.086	1.256	1.117	1.260	1.138	1.275
Apr.	1.075	1.234	1.136	1.294	1.232*	1.414*
May	1.087	1.257	1.132	1.284	1.266	1.446
June	1.092	1.254	1.140	1.307	1.284	1.463
July	1.094	1.256	1.138	1.296	1.292	1.472
Aug.	1.102	1.264	1.119	1.269	....	....
Sept.	1.117	1.273	1.098	1.243	....	....
Oct.	1.108	1.263	1.100	1.231	....	....
Nov.	1.107	1.258	1.112	1.249	....	....
Dec.	1.130	1.290	1.113	1.247	....	....

Hours — Average Weekly Hours per Worker

Month	1944	1945	1946	Month	1944	1945	1946
January	45.2	47.3	41.7	July	45.0	45.5	39.2
February	45.7	47.3	40.8*	August	45.6	41.8	...
March	45.6	45.3	40.8*	September	45.7	43.0	...
April	44.7	45.7	40.3	October	45.9	41.4	...
May	45.1	44.2	39.4	November	45.7	40.2	...
June	45.2	45.2	39.3	December	46.6	40.9	...

Source: U. S. Department of Commerce. * Revised.

Indexes of Production, Shipments and Inventory For The Rubber Industry

Production 1935-1939 = 100 (Based on man-hours)

Month	1944	1945	1946	Month	1944	1945	1946
Jan.	242	247	215	July	227	218	...
Feb.	244	247	216*	Aug.	231	193	...
Mar.	242	236	221*	Sept.	230	172	...
Apr.	231	233	219*	Oct.	231	191	...
May	230	224	215*	Nov.	231	192	...
June	228	222	218	Dec.	239	205	...

Shipments—Average Month 1939 = 100 (Based on $ Value)

Jan.	274	311	229	July	295	274	...
Feb.	299	351	242	Aug.	288	255	...
Mar.	290	351	260	Sept.	297	200	...
Apr.	295	356	282	Oct.	342	260	...
May	293	333	288	Nov.	293	212	...
June	316	333	293	Dec.	341	292	...

Inventory — Average Month 1939 = 100 (Based on $ Value)

Jan.	179.6	170.6	173.7	July	174.7	183.3	....
Feb.	185.2	176.7	179.9	Aug.	172.9	182.4	....
Mar.	187.6	175.5	186.4	Sept.	174.3	177.4	....
Apr.	190.6	175.3	198.5	Oct.	174.3	167.7	....
May	188.1	178.3	195.5	Nov.	176.1	167.1	....
June	182.1	178.7	192.4	Dec.	169.6	169.0	....

Source: U. S. Department of Commerce. * Revised.

Various Compounding Materials Consumed by the Rubber Industry

Material	1939	1940	1941	1942	1943	1944	1945
Asphalt [a]							
Short tons	24,293	22,772	20,536	22,263	16,510	20,189	19,483
% of total	1.0	0.9	0.6	0.6	0.5	0.6	0.5
Barite (Barytes):							
Short tons	3,319	4,283	9,800	6,334	8,000	10,000	10,000
% of total	2.0	2.3	4.2	3.6	3.9	2.9	2.1
Carbon Black:							
Short tons	158,311	155,090	219,751	147,974	236,737	369,015	402,193
% of total	56.5	58.5	68.2	65.8	75.2	78.7	78.9
Clay, Kaolin:							
Short tons	90,287	92,640	127,055	51,334	50,964	59,588	109,936
% of total	11.6	11.1	11.6	5.1	5.5	6.8	11.7
Clay, Fire & Stoneware:							
Short tons	3,770	10,104	9,000	5,000	10,259	7,160	7,800
% of total	0.2	0.4	0.2	0.1	0.2	0.1	0.1
Lead Sulfate, Basic:							
Short tons	140	128	200	89	131	268	200
% of total	2.5	2.1	1.9	1.1	2.3	4.2	5.2
Lime:							
Short tons	1,357	1,879	3,058	1,381	2,039	5,634	7,170
% of total	0.03	0.03	0.05	0.02	0.05	0.13	0.10
Litharge:							
Short tons	1,404	1,590	3,968	3,460	4,302	3,023	1,864
% of total	1.6	1.8	3.3	3.8	3.8	2.2	1.3
Lithopone:							
Short tons	3,189	3,387	3,547	1,047	1,078	726	977
% of total	2.2	2.2	2.0	0.8	0.8	0.5	0.7
Mica, Ground:							
Short tons	2,539	1,731	3,476	1,754	3,063	1,137	3,715
% of total	8.2	6.2	8.0	3.7	6.0	2.2	7.0
Sulfur:							
Short tons	49,000	54,000	63,000	40,000	51,000	63,000	65,000
% of total	2.5	2.5	2.4	1.4	1.8	1.9	2.0
Talc [b]							
Short tons	31,078	28,501	58,114	40,487	48,994	51,833	62,049
% of total	12.4	10.0	13.9	10.0	11.8	13.0	15.0
Zinc Oxide:							
Short tons	70,187	70,979	90,429	52,717	67,898	59,518	63,447
% of total	61.3	62.8	63.4	53.0	47.4	42.3	49.6

Source: U. S. Bureau of Mines.

Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes pyrophyllite and ground soapstone.

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TIME STUDY MAN, experienced in auto tire and tube manufacturing methods, for tire and tube plant in New England. State age, experience, past salary and starting salary desired. Address Box 2265, RUBBER AGE.

CHEMIST, thoroughly experienced in the manufacture of cork and rubber shoe platform material. Give complete details regarding qualifications in first letter. Excellent opportunity for one who can qualify. Address Box 2299, RUBBER AGE.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, and MARCH 3, 1933, of THE RUBBER AGE, published monthly at East Stroudsburg, Pa., for October 1, 1946.

State of New York } ss.
County of New York }

Before me, a notary public in and for the state and county aforesaid, personally appeared Peter P. Pinto, who, having been duly sworn according to law, deposes and says that he is the Business Manager of The Rubber Age and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in Section 537, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers, are:

Publisher, Palmerton Publishing Company, Inc., 250 W. 57th St., New York 19, N. Y.; Editor, M. E. Lerner, 250 W. 57th St., New York 19, N. Y.; Managing Editor, None; Business Manager, Peter P. Pinto, 250 W. 57th St., New York 19, N. Y.

2. That the owner is (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given):

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholders or security holders appear upon the books of the company as trustees or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stocks, bonds, or other securities than as so stated by him.

PETER P. PINTO, Business Manager.

Sworn to and subscribed before me this 25th day of September, 1946.
(SEAL) HERMAN CASAROFF, Notary, Uublic
(My commission expires March 30th, 1947.)

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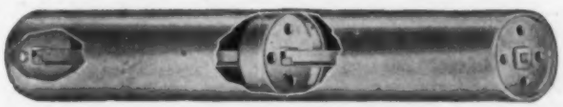

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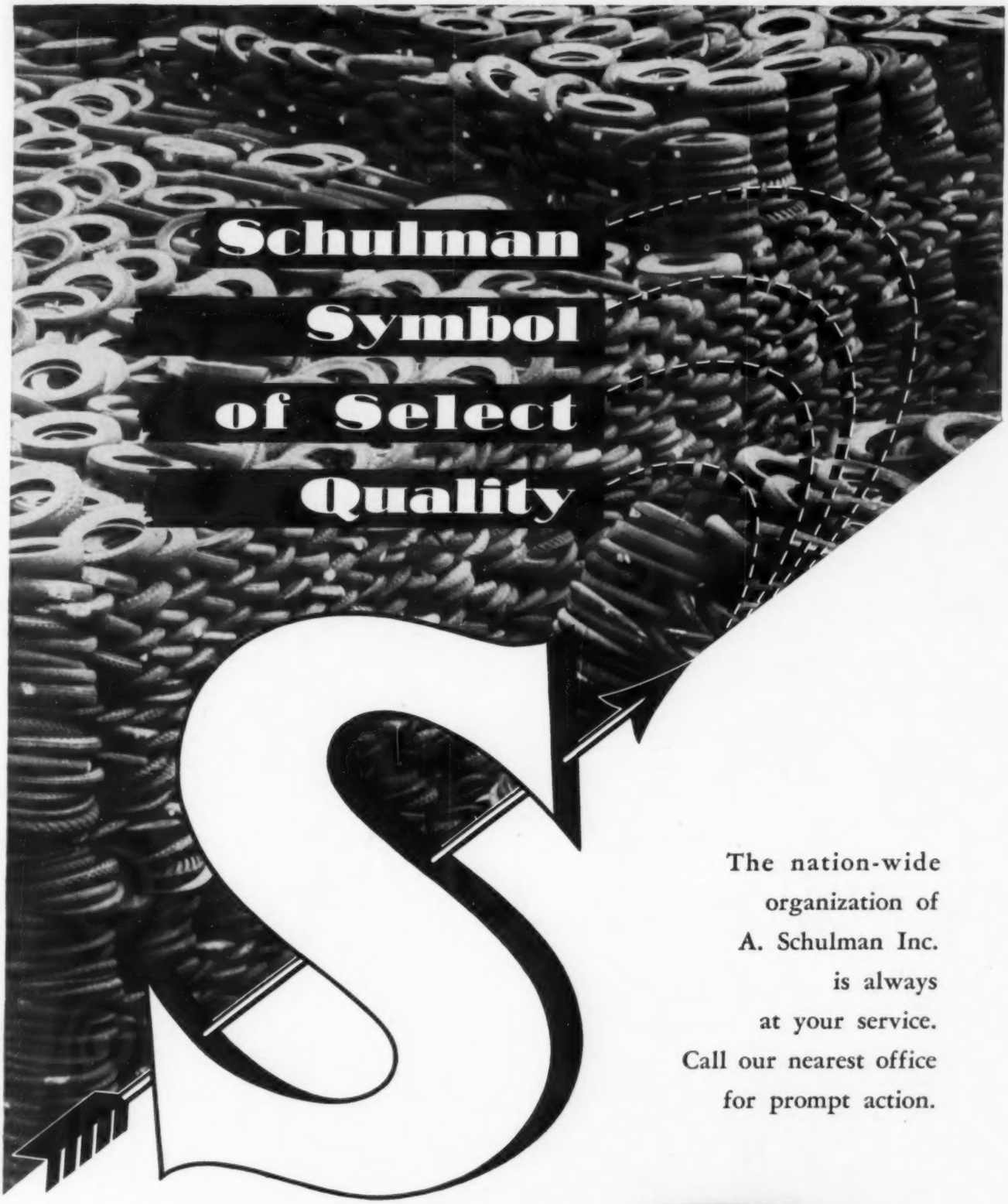

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